ONT, AUGUST 26, 1937. FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

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1496
XXXII

FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Empire Routes

SOME enthusiasts used to proclaim loudly that the air would abolish frontiers, but at present there are no signs of its doing so. The task of organising an air route across many lands is so complicated that one must heartily admire the adroitness with which Pan-American Airways have contrived to run their services through most of the South American Republics.

Imperial Airways exist mainly to run services from end to end of the British Empire. In places they have to cross foreign countries, and a long tale could be told of difficulties with Italy and France, which have now happily been overcome. No difficulties were experienced with Egypt, and after that, on the southern route, only British Governments had to be approached.

Iraq, India, Australia

Going eastward, things proved less easy. Iraq was mandated territory when the service started, but now it is an independent ally. The plans of Imperial Airways were affected by the internal intrigues of the political parties. The chosen spot for the flying boat base was Lake Habbaniyah, near to the new Air Force base at Dhibban. The late Government of Iraq came into power by a *coup d'état*, which was accompanied by the murder of Britain's good friend, Jaafar Pasha, and the party which had seized power refused the use of the lake. Quite recently the moving spirit in that Government, Baqir Sidqi, was himself murdered, and with the change of Government the refusal was cancelled.

The next stage in the old days was Persia, or Iran as its Government prefers that it should be called. That country proved so intractable that finally it was decided to by-pass it and fly down the Arabian coast, where it was only necessary to deal with friendly sheikhs. Next comes India, a British land, but one which for a long time proved an insuperable difficulty. The Indian Government objected to any but an Indian company carrying the mails across India, and during the slump it could find no money at all for a subsidy. Those difficulties were finally overcome, but the decision to change from landplanes to flying boats meant laying out a new route and starting new negotiations. In the landplane days the aerodrome at Jodhpur was very convenient, and His Highness the Maharaja of that State was a very good friend to the flying movement. Flying boats, of course, need water bases and ports of call. Between Karachi and Calcutta there is one obvious port of call, on the river Jumna at Allahabad, in British territory. Two lakes were needed between Karachi and Allahabad, and one was found in the State of Udaipur, in Rajputana, and another in the State of Gwalior, in Central India. The Government of India had to negotiate on behalf of Imperial Airways with the two States.

With the Australian Government differences of opinion have been numerous and continuous. Imperial Airways and the Home Government raised no objections when the Commonwealth insisted on controlling the route as far west as Singapore; it relieved them of subsidy burdens. As in the case of India, a company registered in England was not allowed to fly the mails in Australia or, indeed, from Singapore. So Qantas Empire, Ltd., was formed. Then the Commonwealth objected to the use of flying boats and to the minimum postage rate of 1½d. per half-ounce. These matters were temporarily adjusted, and are in a fair way to permanent settlement later. The latest trouble concerns the landing places suggested in the Gulf of Carpentaria, Groote Eylandt (an island), and Karumba, or Kimberley, on the south-east shore of the Gulf. They are remote from civilisation, and it is stated that it will be a very expensive matter to equip them and to maintain supplies of fuel and oil on them. The matter is considered so serious that Mr. McComb, the controller of the ground organisation in Australia, is to fly to London to confer with the Air Ministry on the subject. All of which shows that an air mail service cannot be opened in a hurry, and no one would care to prophesy when the new quick service will actually get through to Australia.

Preparedness

IF the Marseilles-Damascus-Paris air race has provided any lesson at all, it is that preparedness and training are essential. That was known beforehand and did not need any such driving home. Italy put eight machines in the race and secured first, second, and third places, thereby winning the entire prize money. France put in a heterogeneous collection of four machines, mostly types substituted at the last moment for new models which could not be got ready in time for the race. Great Britain's contribution was a single machine, entered purely by private enterprise and with no form of government or other assistance. Out of Italy's eight starters only four finished the course last Saturday. France similarly got home only one-half of her starters. Great Britain did better than anyone in proving 100 per cent. reliability, and for that the country in general owes a very great debt to Flying Officer Clouston, whose very sporting effort was admired immensely by French and Italian supporters.

France has certainly shown up badly over the race, and the French Press is almost unanimous in its criticism, and even abuse, of the present French Air Minister, M. Pierre Cot, who originated the idea of the New York-Paris race, but who had to substitute the present race for it, owing mainly to America's refusal to have anything to do with a race from New York to Paris. The French Air Ministry offered the prizes, three million francs in all, and special machines were built for the race. None of these was completed in time to be fit for taking part in the race, and their places were taken mostly by old and well-known types. The exception was the Marcel Bloch 160, which is a very modern four-engined monoplane, not unlike the De Havilland Albatross, and the average speed it put up in the race is certainly no guide at all to its real capabilities.

Finally, it is interesting to note that the Italian entries were all modified bombers, manned by Italian Air Force personnel, whose training for the race began as long ago as last March. Italy left nothing to chance, and deserved her win, although the knowledge that her Air Force was virtually racing against civilian competitors robbed the race of much of its interest and made the result almost a foregone conclusion. We may take credit for the fact that the engines were of British design.

A GREAT EXPERIMENT: A group of the new YB-17 Boeing bombers (four 850 h.p. Wright Cyclone Gs) of the first batch of thirteen delivered to the U.S. Army Air Corps. A second order, for a similar number, has been placed. These machines are the first high-speed, four-engined bombers to enter the service of any nation, and their design forms the basis for the new civil transport landplanes under construction at the Boeing factory.

The Outlook

A Running Commentary on Air Topics

Tail Winds

AN examination of the flying times of some of the competitors in the Marseilles-Damascus-Paris race discloses the fact that a very strong following wind must have helped them along very nicely. For instance, the winning machine did the flight of 1,815 miles in a lapsed time of 5 hr. 51 min., which corresponds to a speed of 310 m.p.h.! To get an idea of the extent to which a tail wind must have helped it is only necessary to point out that F/O. Clouston on the Comet did the flight in 7 hr. 36 min., or at an average speed of 239 m.p.h. As it seems probable that Clouston cruised at about 210 m.p.h., the tail wind would be about 30 m.p.h. If that is a reasonable assumption, the still-air speed of the winning Savoia would be in the neighbourhood of 280 m.p.h., which is possible but slightly unlikely. The race lost much of its interest owing to the retirement in Italy of the two Fiat monoplanes. The fastest Fiat, piloted by Rolandi and Bonini, did the trip to Damascus in 6 hr. 13 min., at an average speed of 292 m.p.h., while that flown by Gaeta and Questa took 6 hr. 39 min., its speed being 273 m.p.h.

Much had been expected of the Marcel Bloch 160 piloted by François and Laurent. It took 7 hr. 55 min., so that its route speed was 229 m.p.h. Being among the early starters it is possible that this machine had less tail wind to help it than did the late-starting Italians, and perhaps a still-air speed of 205 m.p.h. for the Bloch 160 may be a reasonable guess. The Fulgur did better at 240 m.p.h.

As the Caudron Typhon is Caudron's version of the Comet it is interesting to note that Maurice Rossi took 11 hr. 5 min. for the trip, averaging the disappointing speed of 165 m.p.h. It seems that either his engines were not working too well or that he must have kept a bad course. He was flying solo, it might be recalled.

Queer Tactics

IT will have been observed that a period of about four hours was deemed necessary to get the thirteen machines away from the Istres aerodrome at Marseilles. But for the fact that one of the last starters was the first man home, it would thus have been impossible to know, until after most of the competitors had returned, who was the actual winner of the race. It seems that originally the French Air Ministry entrusted the French Aero Club with the organisation of the start, but that when the club discovered that Italian service personnel was flying the machines it declined to "control" military pilots. The French Air Ministry then had to take over, and apparently gave the competitors a free hand, leaving it to them to fight it out among themselves how they should arrange the start so long as they were all happy about it.

By mutual consent, the story goes, it was decided that the French would go first and the Italians last so as to get as much "lift" as possible for the take-off from Istres. That may or may not be true, but the free and easy way of handling the start has surely never had its counterpart in any international race. It probably did not affect the ultimate result in the least, but it is certainly an amusing sidelight on modern France.

Australia's Air Defence

IT is understood that the Australian Defence Department intends to recommend increasing the Royal Australian Air Force to a strength of seventeen squadrons, which on a basis of twelve machines to a squadron means 204 first-line aircraft. In the event of a hostile attack Australian defence plans must primarily be based on the theory that help will be received from Singapore; but if that help were to be delayed the problem would seem to be how best to strike hard blows at an enemy force which attempted a landing at some point on the enormously long coast line. Obviously the resources of such a small population could not provide a navy large enough for protection of the whole coast, but it is within the power of the Commonwealth to maintain an Air Force which could at least harass an approaching fleet, and could make the landing of an army a very expensive task.

For such an operation the R.A.A.F. would require reconnaissance squadrons to find the approaching enemy, some fighter squadrons to engage the fighters of the enemy's carriers, and a striking force to attack the ships and afterwards to bomb the landing parties and the camps. The Seagull amphibians on the Australian seaplane carrier would be useful for the reconnaissance, but some long-range aircraft (say two squadrons) would also be desirable, for early location of the enemy would be very important. From a distance it is hard to estimate the number of fighter squadrons that would be desirable; perhaps three would be thought enough for a start. That would leave a striking force of ten squadrons, bombers and torpedo-bombers, which would need to have a good reserve behind it.

The Remounts

FROM 200 m.p.h., or even slower, biplanes with ground-rated engines to 300 m.p.h. cantilever monoplanes with highly supercharged power plants, flaps and retractable undercarriages is a long stride, but it is, apparently, a step which Germany is being forced to take in her programme of re-equipment. Admittedy the situation in this country is similar, for it seems that a large number of Fury and Gauntlet pilots will be put straight on to Spitfires and Hurricanes, although the flapped Gladiator, with its higher performance, is a useful intermediate type. From what little knowledge we have to go on, however, it appears that these apparently dangerous transitions will not be so serious as is generally expected; the reason is the tractability, despite their advanced characteristics, of most of the new monoplane fighters.

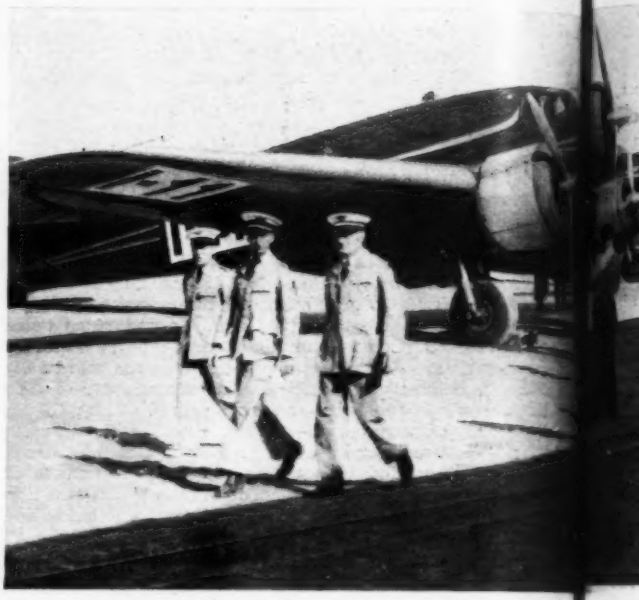
Until very recently the only fighters known to be available to German pilots were quite archaic in conception, whereas the projectiles by Messerschmitt and Heinkel, which caused something of a sensation at Zürich the other week, are quite as up to date as anything of their kind in the world. In fact, their inverted-vee Junkers and Mercedes engines give them a little extra something the others (barring the light Mureaux and Caudron of questionable practicability) are lacking.

Although Germany, like Great Britain, realises the value of advanced-fighter-trainer types, it seems that such machines will not be in service until after the initial batches of high-performance fighters have been delivered.

DIARY OF FORTHCOMING EVENTS—PAGE 208

MARSEILLES—DAMASCU

The Race Won by Italy at 219 m.p.h. : Italians Also Second and Third : Great Britain's Lone Hand Fourth



AS many had expected, Italy won the great air race from Marseilles to Damascus and Paris ; not only so, but Italian machines secured second and third places as well, all three machines being of the Savoia-Marchetti S.79 type, fitted with three Alfa Romeo 126 R.C.34 radial air-cooled engines of 750 h.p. each, or a total of 2,250 h.p. The sole British competitor, Flying Officer A. E. Clouston, put up a magnificent fight, but with not much more than 400 b.h.p. his De Havilland Comet was obviously no match for the high-power Italian aeroplanes. In spite of this, however, Clouston put up the fourth fastest time, which can only be described as a very fine performance. His average speed for the 3,850 miles was 196 m.p.h., a figure which indicates that Clouston and his navigator, Flt. Lt. G. Nelson must have flown a very good course.

By securing first, second and third places in the race, the Savoia entry thus wins the whole of the prize money of three million francs—1,500,000 for first place, 1,000,000 for second, and 500,000 for third.

The Winner

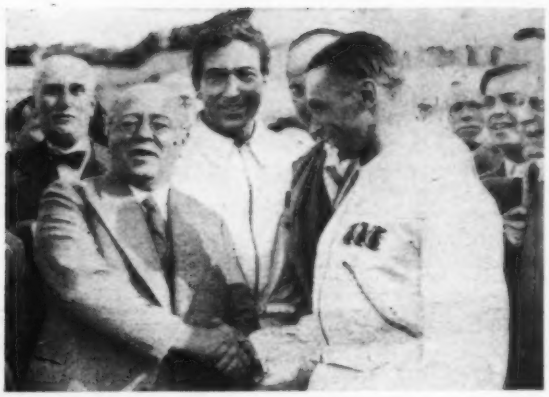
Winner of the race was the S.79 (I-CUPA) of which Lt. Col. Samuele Cupini was chief pilot. Cupini was accompanied by Amadeo Paradisi as second pilot, and the other two members of his crew were Andu (engineer) and Vaschetto (radio operator). The lapsed time of I-CUPA was 17 hr. 32 min., and the time spent in refuelling at Damascus was 52 min. The average speed was 219 m.p.h. Second place was secured by Capt. Umberto Fiori in I-FILU, whose lapsed time was 17 hr. 57 min. ; he spent 43 min. in refuelling at Damascus, and his average speed was 214 m.p.h. Lt. Col. Attilio Biseo was third in I-BUMU with a lapsed time of 18 hr. 3min., a refuelling time of 49 min., and an average speed of 212 m.p.h. Lt. Col. Biseo had with him as second pilot Lt. Bruno Mussolini, son of the Duce. Flying Officer Clouston came fourth with a lapsed time of 19 hr. 41 min., a refuelling time of 23 min., which was the lowest scored in the race, and an average speed, as already mentioned, of 196 m.p.h.

The Savoia-Marchetti S.79 monoplanes entered in the race were originally prepared for the New York to Paris race, and when that was abandoned and the Marseilles-Damascus-Paris race substituted, it was not found necessary to make any alterations. The machine has been developed

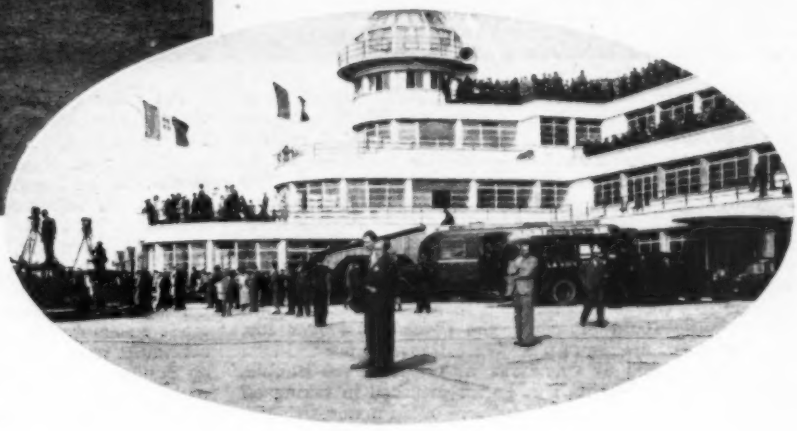
(Left) One of the Fiat BR 20 As, which like the Savoia-Marchettis, are adaptions of a bomber type.

(Below) The Breguet Fulgur in the foreground came fifth, averaging 182 m.p.h. Seventh place was secured by the big Bloch 160 in the background.

PARIS



The winners, Cupini and Paradisi, congratulated by M. Sarraut on behalf of the French Government. Note the "Three Green Mice" squadron badge.



(Above) Two of the Savoias and the pair of Fiats. The Savoia in the immediate foreground is the actual winner. The engines are understood to be of the Bristol Pegasus type built under licence and, as may be seen, have the latest type of Bristol cowling.

(Right) Part of the crowd at Le Bourget waiting to welcome the victors.

from the S.79 military type by leaving out all military equipment and substituting a fuselage of smaller cross-section.

The S.79 is of "mixed" construction, with an all-wood wing and a welded steel tube fuselage. The undercarriage units retract into the fairings of the wing engine nacelles, and full-span high-lift devices are used. It is claimed that the machine is capable of taking off satisfactorily with wing loadings up to 48 lb./sq. ft. when the power loading is 15 lb./h.p. Much depends, of course, on one's interpretation of the expression "satisfactorily." The three Alfa Romeo 126 R.C.34 engines are housed in long-chord cowlings, and drive Savoia-Marchetti variable-pitch three-bladed airscrews. They are Bristol Pegasus, built under licence. The maximum speed is reported to be in excess of 260 m.p.h.

It is an interesting point that five of the Savoias, including the victorious trio, were fitted with the Smith automatic pilot; Mr. H. M. Samuelson, of Smith's Aircraft Instruments, went out to Guidonia—Italy's Farnborough—to superintend their fitting.

Start Postponed

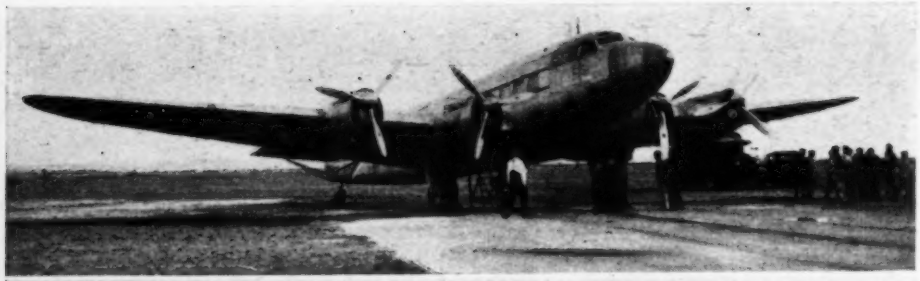
Originally it had been intended that the start from the Istres aerodrome, Marseilles, should take place last Friday morning, but ultimately it was postponed until Friday evening, the order of starting being decided by drawing lots and the French competitors starting first, the British second, and the Italian third. The starting period for the thirteen machines extended over approximately four hours, Maurice Rossi being first away on the Caudron Typhon at 6.25 p.m., and the last Italian, Lt. Col. Biseo, leaving at 10.34. Rossi was the only competitor to fly solo, and his machine was equipped with a Sperry automatic pilot to enable him to attend to navigation.

Second away, at 7.49, was Col. Henri François in the Marcel Bloch 160, F-ARFA, with four 720 h.p. Hispano engines. Capt. Laurent was second pilot of the Bloch 160, and the machine carried a navigator, an engineer and a radio operator. Paul Codos, famous co-pilot of Rossi in many long-distance flights, was chief pilot of the Breguet Fulgur, which was next to start. This machine had been substituted for the Air-Couzinet 10, which could not complete its tests in time to take part in the race. Codos had with him as second pilot another famous French pilot, Arnoux, and a radio operator. The Fulgur has two Gnome-Rhone K.14 engines.

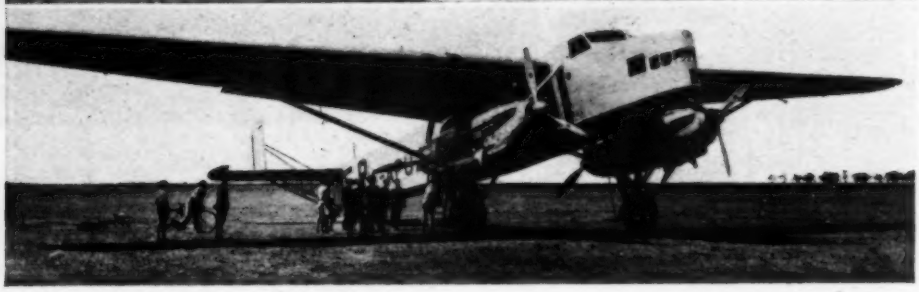
The fourth and last French starter, the Farman 2231 with four Hispano Xbrs engines, was piloted by Henri Guillaumet, whose second pilot was Louis Lanata, and which also carried a radio operator.

F/O. Clouston got away at 9.20, and was followed three-quarters of an hour later by the first Italian, Capt. Umberto Rovis, in an S.79. Then followed, with about seven minutes' intervals, the two Italian Fiat B.R.20 machines piloted by Lt. Col. Rolandi and Lt. Col. Gaeta respectively. The five remaining S.79s were piloted by Capt. Fiori, Capt. Lippi, Commandant Tondi, Lt. Col. Cupini, and Lt. Col. Biseo respectively.

The Fiat B.R.20 monoplane is of the all-metal twin-engined type, and is fitted with 1,000 h.p. Fiat A.80 engines. Like the S.79, it has been developed from the military type, the most notable change being the omission of military



Powered, like the Farman below, with four Hispano Series X engines of 720 h.p. each, the Marcel Bloch 160 has only very recently completed its tests. The radiator arrangements should be compared with those of the Farman.



The Farman attempted to fly the whole course non-stop but landed at Belgrade.

equipment and the installation of auxiliary petrol tanks in the fuselage. With the extra tanks the still-air range is approximately 4,000 miles. The Fiat A.80 R.C.41 engines are eighteen-cylinder double-row radials supercharged to 13,500ft. Fiat three-bladed v.p. airscrews are used. The maximum speed at 15,000ft. is claimed to be 270 m.p.h.

During the hours following the start of the last Italian, reports came in about the progress of the race. The Italians were stated to have reached Damascus at an average speed in the neighbourhood of 270 m.p.h. Clouston's average was reported to be about 240 m.p.h., the Fulgur's about the same, the Bloch's just over 200, and the Farman's 185 m.p.h. Word was also received that Rossi had retired at Damascus with mechanical trouble, and that one of the Italians had overturned in taking off from Damascus owing to the collapse of his undercarriage.

The order of arrival of the first four in the race has already been recorded above. Codos, on the Breguet Fulgur, came fifth, with a lapsed time of 21 hr. 3 min., a refuelling time of 50 min., and an average speed of 183 m.p.h. Major Tondi (I-TOMO) took 21 hr. 34 min., spent 37 min. in refuelling, and averaged 178 m.p.h. The Bloch 160 piloted by Col. François took 22 hr. 38 min., 46 min. in refuelling, and averaged 170 m.p.h.

One of the Savoia machines and the two Fiats landed in Italy on the return flight, and the Farman piloted by Guillaumet was forced by stormy weather to retire at Belgrade on his way back to Paris. One of the three Italians continued next day, and arrived at Le Bourget at noon on Sunday. The Farman arrived from Belgrade a couple of hours afterwards. Thus out of thirteen starters nine machines completed the course.

SIDELIGHTS ON THE RACE

THE bad showing in the race by France has brought down on the head of M. Pierre Cot, the French Air Minister, a storm of criticism and abuse from almost every newspaper in the country. Here are some typical examples:

L'Intransigeant: "Every Frenchman demands that the painful lesson of the race shall not be wasted."

Paris Soir. "The Italian victory gives us a further reason to recognise our unjust inferiority."

Le Jour: "The race should show M. Pierre Cot the progress which our aviation has made under his administration—the result of his deceptive statistics, of his ruinous utopias. It is a startling proof of his shortcomings; of setbacks due to disorganised administration, to delays in production by a disordered industry and the misapplication of social laws. France cannot regain her high place in aviation while employees are pitted against employers and deprived of incentive and team spirit. M. Pierre Cot, who pretended to assist aviation, has done it a severe injury. He intended that the race should demonstrate the progress we have made under his administration. So well has he sensed his failure that he prefers to hide himself in the fogs of a northern capital."

Le Journal. "When a French prototype makes its first appearance, so many years have elapsed between conception and production that it is obsolete before being test-flown."

Le Petit Journal: "Our crushing defeat to-day by foreign competitors (Italian and British) is due to M. Pierre Cot's political partisanship. It is only fair to attribute it to this man who introduced nationalisation of the aircraft industry and who, in so doing, became responsible for all the delays in delivery of equipment. Not the last to complain are pilots who are primarily interested in the well-being of the service. Of four machines entered for the race by the Air Ministry, only two were ready—a few hours before the start. And the bitterness of the defeat is aggravated by the fact that this 'sock on the jaw' has cost the country three million francs, plus the entrance fees of 5,000 francs per machine. How often has M. Cot been seen on an aerodrome? His proper place this week would have been at Istres, to study more closely than on paper the superiority of the machines which were to win the race."

Le Matin: "Our only shred of consolation is the fifth place gained for France by Codos in a machine selected at the last moment."

Paris Midi: "Everyone regrets this exaggerated taste for improvisation that has deprived our teams of the fast machines with which our technical skill could easily have supplied them."

* * *

In Paris after the race it was freely rumoured that M. Cot's protracted absence in Norway forebodes an early resignation, and there are many who believe that M. Laurent Eynac may be reappointed to the post of Air Minister, which he has held so often and so long in the past. Certain it was that at Le Bourget last Saturday he cast wistful glances at the flagstaff outside the control tower as the Fascist flag was hoisted three times in thirty-four minutes for the first three arrivals and then was replaced by the Union Jack as Clouston came in fourth.

* * *

The performance of Clouston and Nelson was heartily applauded on all sides. On the front page of *L'Oeuvre* their feat was featured in the following headline: "Clouston, magnifique sportsman, étonne le Monde et se place." All through Saturday afternoon a stream of wireless messages reported progress of other competitors, but of the

Comet no word was received from the time it left Damascus. Clouston and Nelson came through non-stop in conditions which nearly put them out of the race. Nelson did not use his wireless at all, and navigation was carried out by sextant. They met heavy mist over the Aegean and suffered from ice accretion over the Alps; this at one time forced them down from 15,000 ft. to about 200 ft. Clouston carried on his nose the imprint of blue paint from the cabin roof, so a bumpy trip was rather indicated.

* * *

One spectator at Le Bourget was heard to remark: "To us it seems rather droll that for an international sporting contest arranged by the French Republic the Fascist Dictator should have entered a whole squadron of bombers, manned by serving officers, directed by the Air Ministry and backed by the entire resources of their nation"!

The Italian squadron has been in strict training since March. When they arrived at Istres on Wednesday of last week they were accompanied by one hundred mechanics of the Italian Air Force. None of the eight machines carried a crew of less than four. Those commanded by Lt.-Col. Rovis and Lt.-Col. Biseo each carried five. In spite of this only four of the eight machines stayed the course. Lippi broke his undercarriage at Damascus; Rovis and Gaeta landed at Venice, and Rolandi at Pola.

* * *

Rather a neat aid to identification was used by the Italians in their registration letters on race machines. The last four letters following the I- represented the names of first and second pilots. For instance, the letters of the winning machine, which was piloted by Cupini and Paradisi, were CUPA; those of the machine flown by Fiori and Lucchini were FILU, and so forth.

THE PROGRESS OF THE DAMASCUS RACE

Placing	Race No.	Registration No.	Crew	Machine		Engine		Power	Departure from Istres	Arrival at Damascus	Departure from Damascus	Arrival at Le Bourget	Remarks
				Make	Type	No.	Maker						
GROUP I.—FRENCH.								H.P.					
	F.4.	F-AODR	Maurice Rossi ...	Caudron	Typhon	2	Renault	220	18.25	5.30	—	—	Retired at Damascus.
7	F.3.	F-ARFA	Henri Francois Ernest Laurent	Bloch	160	4	Hispano Suiza	720	19.49	3.44	4.36	18.30	Av. speed, 169 m.p.h.
5	F.1.	F-APDV	Paul Codos Maurice Arnoux	Breguet	Fulgur	2	Gnome Rhone	900	20.01	3.35	4.39	17.03.37½	Av. speed, 182 m.p.h.
	F.2.	F-APUZ	Henri Guillaumet Louis Lanata	Farman	2231	4	Hispano Suiza	720	20.12	5.48	*5.48	—	*Without landing. Landed Belgrade 18.10.
GROUP II.—ENGLISH.													
4	G.16	G-ACSS	A.E. Clouston G. Nelson	De Havilland	Comet	2	Gipsy	200	21.20	4.56	5.19	17.01	Av. speed, 194 m.p.h.
GROUP III.—ITALIAN.													
	I-12	I-ROKT	Umberto Rovis Klinger Stephano Trimboli	Savoia-Marchetti	S.79	3	Alfa Romeo	750	22.02	4.05	5.00	—	Landed at Venice, 15.30.
	I-8	I-ROBO	Enrico Rolandi Guido Bonini	Fiat ...	BR 20	2	Fiat ...	1,000	22.07	4.20	5.28	—	Landed at Pola, Italy.
	I-10	I-GAQU	Giuseppe Gaeta Luigi Questa	Fiat ...	BR 20	2	Fiat ...	1,000	22.14	4.53	5.31	—	Landed at Venice, 15.30.
2	I-13	I-FILU	Umberto Fiori Giovani Lucchini	Savoia-Marchetti	S.79	3	Alfa Romeo	750	22.20	4.15	4.58	16.17.1½	Av. speed, 213 m.p.h.
	I-7	I-LICA	Antonio Lippi Gori Castellani	Savoia-Marchetti	S.79	3	Alfa Romeo	750	22.24	5.44	—	—	Retired at Damascus.
6	I-6	I-TOMO	Angelo Tondi Ant. Moscatelli	Savoia-Marchetti	S.79	3	Alfa Romeo	750	22.28	4.27	4.56	20.02	Av. speed, 177 m.p.h.
1	I-11	I-CUPA	Samuele Cupini Amedeo Paradisi	Savoia-Marchetti	S.79	3	Alfa Romeo	750	22.31	4.22	5.14	16.03.45½	Av. speed, 218 m.p.h.
3	I-5	I-BUMU	Attilio Biseo Bruno Mussolini	Savoia-Marchetti	S.79	3	Alfa Romeo	750	22.34	4.19	5.17	16.37.35½	Av. speed, 212 m.p.h.

ONE THOUSAND HOURS!

The Amazing New Overhaul Period for Gipsy Major Engines

WHEN Louis Blériot flew across the English Channel in 1909 he was deliberately taking a chance on his little 25 h.p. three-cylinder Anzani engine keeping going for the necessary time. Past experience had shown him that the average time of running before a breakdown of some sort occurred was just a little less than the time he estimated his Channel-crossing would take. A friendly shower on the way provided him with a few minutes' "water cooling," and this helped the engine to keep running just long enough for Blériot to get over the British coast. That was but 28 years ago, and yet we now have a firm announcing that the period between major overhauls of one of its engine types has been increased to 1,000 hours. It would be difficult to imagine a better example of the progress made with aero engine design and construction.

As a result of close collaboration between Captain Geoffrey de Havilland and Major F. B. Halford, the first De Havilland engine, the Gipsy I, was produced and put on the market in 1928. Both knew the temperamental nature of the aero engines of that period, and both felt that the simple, straightforward four-cylinder type which had stood the test of time in car work was the logical type for aero engines of moderate power. The complications of water cooling could, they thought, be avoided, and so the first Gipsy engine was a four-cylinder, in-line air-cooled. This engine quickly established a reputation for itself, and the original period between overhauls was fixed at first at 300 hours. Later this was extended to 450 hours, a period which also became standard with the Gipsy II, III, and Major models which followed the Gipsy I.

The Gipsy Major, it may be recalled, made its first public appearance in the King's Cup Race of 1932, and made it to such good effect that it won the race. It was installed in a Fox Moth piloted by Capt. W. L. Hope, and the win was quite a walk-over. For the extra speed, compared with the standard Fox Moth, doubtless the first Gipsy Major was largely responsible. In those days, by the way, the engine was not called the Major, but was referred to as the Gipsy III A. Experience soon proved the Major to be a very reliable engine, and on July 28, 1933, the overhaul period was extended from 450 hours to 750 hours. This is now still further extended, and it seems likely that the De Havilland Company is the first in the world to set the period between major overhauls at 1,000 hours.

More Than 2,000 in Use

That an aero engine will run satisfactorily for such long periods is testimony to the excellence of the design of the original Gipsy Major, for although it has been constantly improved in detail, there have been no major modifications (no pun intended) since it was introduced in 1932. At the present time something like 2,200 Gipsy Major I engines have gone into service, and Mr. A. J Brant, De Havilland's service manager, estimates that the average log book hours of all these Majors is probably 500 hours. Many have exceeded 2,000 hours. Accepting the 500 hours average, this means that 1,100,000 hours have been flown by Gipsy Majors, and at an average speed of 100 m.p.h. this represents 110 million miles flown! It is the proud boast of the firm that the number of engine failures in all this experience is so small that the service department can remember them case by case. Small wonder, therefore, that the company feels justified in setting this new high-water mark in overhaul periods.

CORRESPONDENCE

THOSE DISTANCE RECORDS

AS a pilot who is very interested in the question of distance records, may I ask for a little space in which to reply to Mr. H. L. Brook's question?

A few years ago I was engaged in the motor trade, and was driving, and racing, cars for a living. From the public's point of view, the interest centred round the world's flying start one mile record at Daytona (and afterwards at Utah). Then somehow, the newspapers began to boost the great dual between the Austin Sevens and the M.G. Midgets. Records at fairly low speeds, if put up by a "Baby" car (i.e., engine of 750 c.c.), were given more prominence than far faster speeds put up by the big stuff.

I would suggest to Mr. Brook that the same sort of thing will happen in aviation. When the speeds on the Cape, Atlantic and Melbourne routes have risen a little higher, interest will die out; the public would not wish to fly day and night at such speeds, even if they could afford it. Nor will anyone else, generally speaking.

But suppose we forget the absolute speed part of the question and introduce other conditions to make things sporting and interesting to the *average* human being? Capt. Neville Stack had the right idea a few years ago when he made his own type of records. Some of these, I believe, still stand.

We shall get pilots flying Gipsy Moths (open cockpit, with draughts complete) at the astounding average of 75 m.p.h. between London and the North Pole or Equator. Then the average will creep up, by easy stages, to a level 80. Public interest will reach boiling point at the idea of an ultra-light allowing its owner to breakfast at Brooklands, lunch at Lympne, tea at Tangmere, and dine at Dieppe. The distance record game is only just beginning, if we do not regard sheer speed as the be all and end all of each course.

So when one of the great Dailies will finance me (say to the extent of £10, top limit), the world will be shaken to its core by a "Baby plane" record from England to the Isle of Wight. And all because someone will have said in loud headlines that it is a record. You'll see. KISMET.

Ashtead, Surrey.

THEORY AND PRACTICE

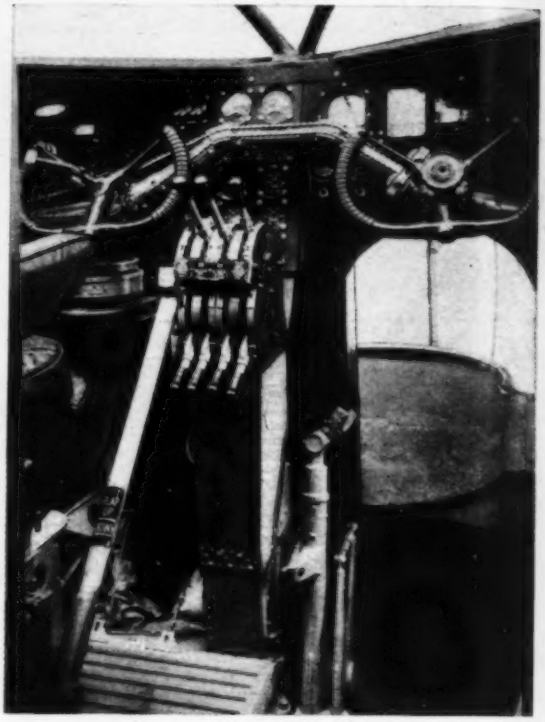
MR. C. W. MARTIN'S letter in the issue of August 12 came as a very pleasant surprise to me, in that he appears to infer that, at last, geometry is being taught to students at those institutions which specialise in air navigation. Whether the problem of proportional triangles is handled by geometry or trigonometry is of small consequence, but it is a decided step in the right direction to know that *all* future air navigators can expect to be taught the principles of these problems, and not merely their application.

I quite agree that problems such as the "three-bearing" and "running fix" are of little practical use in the navigation such as is in use along short and well-marked traffic routes, and had he consulted his assistant, who is, I understand, one of the much-despised marine navigators, he could have ascertained that such methods are seldom used in practical marine navigation. But during a recent flight in a Service machine suitably equipped with a chart table I saw the "running fix" used with considerable success. Also, with the inception of long-distance flights, on which celestial navigation will be used, the "running fix" will be incorporated frequently with certain "position line" methods.

Mr. Martin's letter, whilst appearing to belittle the marine navigator who is teaching air navigation, forms, in reality, a strong criticism of the Air Ministry's requirements for licensed air navigators. The Air Ministry, believing, no doubt, in the necessity of mastering the theory before attempting to put it into practice, demands a knowledge of these problems on the part of the candidate for air navigators' licences. The individual navigator, having been taught the theory at school, is then at liberty to apply the method best suited to the occasion. The success of the application depends entirely upon the individual's experience in practical navigation, and this experience can never be obtained in a school on the ground, any more than can the marine navigator obtain experience in practical navigation at a school ashore. Thoroughly equip the navigator with the theory and he will be all the more readily able to put it into practice. Speed and accuracy will only come with constant use of the various methods. Mr. Martin may be interested to know that some of the finest teachers of marine navigation have never been to sea at all, and yet their students have done remarkably well as practical navigators.

Lastly, will Mr. Martin enumerate those "hidebound marine methods" to which he objects? It will be interesting to those marine navigators who teach air navigation as part of their curriculum to see in what way the methods they use transgress.

E. BROOK WILLIAMS,
Senior Lecturer, Dept. of Navigation.
University College, Southampton.



A BOMBER'S BRIDGE: The pilot's cockpit of a Handley Page Harrow Mk. II heavy bomber, showing the location of the flying controls, including the long operating lever for the Dowty flap gear, and the Hobson mixture and throttle controls associated with the twin Pegasus XX fully supercharged radials. (*Flight* photograph.)

Caproni Agency Appointment

IT is announced that the Earl of Hardwicke has been appointed director and chairman of Caproni Agency Corporation (England), Ltd., in succession to Major E. Howard.

Forthcoming Events

August 3-September 7. Public Schools Aviation Camp, Norwich.
August 22-29. Italian Aero Club: Circuit of Littorio.
August 28 and 29. Cinque Ports Flying Club: Lympne International Rally and Wakefield Trophy Race.
August 28-September 25. B.G.A. National Soaring Competition, Great Hucklow.
September 4 and 5. Southend Flying Club: At Home.
September 10-11. R.Ae.C.: King's Cup Race.
September 12. Aero Club de France: Coupe Deutsche de la Meurthe, Etampes.
September 18. North of Ireland Aero Club: Ulster Air Rally, Newtownards.
September 18. Eastbourne Flying Club: At Home.
September 23. Aero Golfing Society: Cellon Trophy.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

KITE-FLYING in the Byfleet area has been banned by the police following complaints by Brooklands aerodrome authorities.

Miles. Maryse Bastie and Suzanne Tellier have completed a 15,500-mile survey flight to Siberia and back to France in just under a month. They used a Caudron Simoun.

A captive barrage balloon broke away from its moorings at Cardington last week and travelled for nearly fifty miles before its cables became entangled in a tree near Bury St. Edmund's.

A prominent personality in Germany is reported to have said that by November 1 five hundred Messerschmitt 109 single-seater fighters will be in service with the German Air Force.

The American concern United Air Lines will soon be operating about seventy high-speed twin-engined transports, comprising forty Douglas DC-3s and, roughly, thirty Boeing 247-Ds.

The Willingdon Cup for the most meritorious performance of 1936 by an Indian or Indian-trained pilot has been presented to Mr. P. D. Sharma, employed by Indian National Airways. Mr. Sharma flew 750 hours during the year, over 80 by night.

Indistinct radio signals have been received on a wavelength which corresponds with that used by Levanevsky and his companions who have been missing in the Far North for a fortnight. Sir Hubert Wilkins and James Mattern have joined in the search.

The T.K.4 monoplane, built by students of the De Havilland Technical School, has been taken to Martlesham. It is reported, unofficially, that handling trials revealed that there was nothing vicious about the machine. A description was published in *Flight* of August 12.

The Boeing School of Aeronautics has completed a new training monoplane with a 320 h.p. Wright Whirlwind. The wing has an aspect ratio of 9:1. Despite the fact that the undercarriage is fixed, the estimated cruising speed at 10,000 ft. is 223 m.p.h. The machine has been designed to reproduce many of the characteristics of modern transports.

OUT OF THE SUN: A Lockheed Twelve dives past the machine park during a recent display at Vancouver. In the foreground is a visiting Supermarine Walrus, which startled everyone by its agility.

STABLE TALK: Mr. Bob Waite (pipe in mouth), who will fly the T.K.4 in the King's Cup Race, discussing some of the finer points of his mount at the D.H. Technical School.

The two occupants of an R.A.F. machine escaped without injury when they hit an 11,000-volt electric cable near Shoreham.

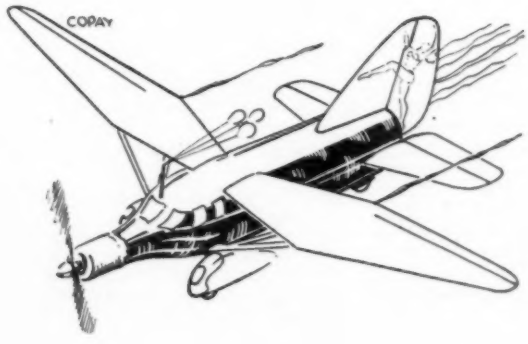
The Miles Hobby entered for the King's Cup Race is a low-wing monoplane with Series II Gipsy Major engine and a retractable undercarriage. It might make a useful fighter-trainer.

The official international ratings for the Siddeley Tiger VIII two-speed supercharged radial described in *Flight* last week are: 805-845 at 2,375 r.p.m. at 6,250 ft. with the "moderate" supercharger and 725-760 h.p. at 2,200 r.p.m. at 12,750 ft. with "full" supercharger. The maximum power with full supercharge at 14,250 ft. is 780 h.p. at 2,450 r.p.m. and the take-off output (moderate supercharge) 880-920 h.p. at 2,375 r.p.m.

THE UNKIND UNTRUTH

(with apologies in all directions)

No. 2. The Westland Whoopee, or Lysandeman

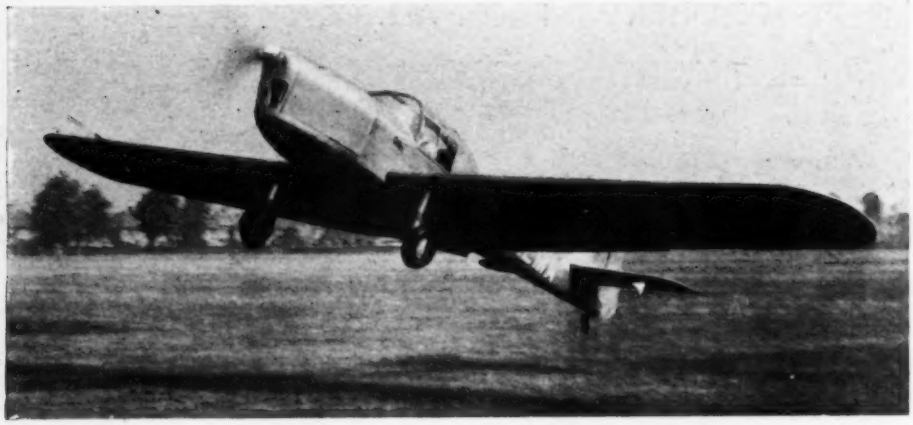


Twenty-five Years Ago

(From "Flight" August 24, 1912.)

"We are becoming so used nowadays to lengthy cross-country flights that we are apt to miss the significance of many which would have been regarded a year or two ago as epoch-making. For example, the really fine flight of Audemars from Paris to Berlin—the first in which the journey between the two capitals has been successfully accomplished — has been allowed to pass without mention, or at most has been dismissed in a three-line paragraph."

PRIVATE FLYING



THE CYGNET MAJOR: The new C.W. Cygnet with a Gipsy Major engine, shown here in the act of being taken off by Mr. Wynne-Eaton at Hanworth, is one of the King's Cup entries. In the race the machine, which has been modified in certain details, will be flown by Mr. Charles Hughesdon.

Topics of the Day

More Gadgetry

THERE seems to be no limit to the number of devices which can be produced for the simplification of navigation—or to the ingenuity of individuals who have grown tired of rule-of-thumb methods.

Following the little marine interlude and the remarks thereon, a keen yachtsman has written to proclaim the virtues of the Lenthall "Navigraph" rule. On hearing its name one might expect to see some contrivance with a mass of arms and scales designed to solve problems in spherical geometry. In fact, it is simply a flat rectangular piece of celluloid engraved with a distance scale, a number of parallel lines and a half-protractor with 0-90° and 360° reciprocal bearings; alternatively, this protractor can be marked in points for nautical use.

It can be used for drawing and measuring tracks, for laying off bearings, or for a number of combined and similar purposes. You simply lay the edge, or one of the parallel lines, along the proposed track and read off the bearing of this track (whether drawn or otherwise) against a convenient meridian. The advantages of the device are that it can be slid about the map as required, that the map can be read through it, and that it is small enough to be used in the air on a map or chart which is merely laid across one's knee.

While travelling last week-end with Mr. J. C. C. Taylor in the Shell Hornet I had a chance of playing with a masterpiece of gadgetry which he had designed and made for his own use. This device would primarily be valuable to anyone who kept his machine at, and normally operated from, one particular aerodrome—in this case Hatfield.

All in One

BRIEFLY described, the device consists of glass-mounted sections of four- and ten-mile aviation maps, with course, distance, and proportion calculators and scales arranged around the base aerodrome.

The map sections are mounted back to back within a square transparent frame about six or seven inches in diameter. On one side, therefore, a small four-mile section, and on the other a ten-mile section, can be seen. On one side the names, distances, and bearings of all likely aerodromes are arranged concentrically; a transparent movable arm, centred at Hatfield and lying flush with the rest of the mounting, is marked with a long arrow, the shaft of which is measured off in miles. When setting off for any destination the arrow forms the initial part of the track, and during the first and most important few miles of a journey one's course can be accurately adjusted and one's ground speed checked.

Once outside this little area the device can be turned over to the side with the ten-mile section. Here is a similar but larger arm with three concentric rings marking ten-, twenty-, and thirty-mile limits. The outer ring is graduated through 360°, while on this side, also, is a proportional calculator and a squared area over which the arm can act as a course and distance calculator.

The great feature of the device is that everything except the map sections is transparent, and until one's machine is well and truly on course there is no need to use anything else. Real maps can then be unfurled at leisure and with one's mind at rest. In cases where an aerodrome has no particular distinguishing landmarks in the immediate vicinity, the device can, of course, be equally useful during the last twenty miles or so of a return flight in conditions of poor visibility.

It simply is not possible to explain all the features and uses of such a gadget, but I have said enough to indicate the sort of thing which can be developed with a little ingenuity and patience.

Bradshaw's Guide

SO long as one can see a mile or more, and so long as one can fly at more than 800ft., I am a purist so far as navigation is concerned, but I have long since lost that callow intolerance of Bradshaw flying. In Q.B.I. conditions it is the only safe way of getting about, since by such means it is possible to know exactly where you are *all* the time, thus avoiding hilltops and radio masts.

After a minor experience last Saturday, when weather forced me to return to my starting point, I have almost decided to work out Bradshaw approaches to every aerodrome which is used with any frequency. As it happened, my mental subtractions and additions in this case were correct and I flew back right over the aerodrome. But I might have found myself over unrecognisable country within a mile of the place, and it would have been far safer to have Bradshawed.

Watford, after all, looks very like Wellingborough when viewed from 300ft. in visibility of half a mile, and nothing can be quite so urban as a town which is being examined from such an angle. The place is just a mass of factories, railway stations, cinemas, and tramcars. I'm a nervous subject, anyway.

INDICATOR.

Private Flying

FROM the CLUBS and SCHOOLS

LONDON

OVER sixty-nine hours represented the total flying time last week. Messrs. A. Lambart and A. Van Zeller completed their "A" licence tests.

REDHILL

The flying time for the week ended August 20 amounted to 40 hr. 35 min. Mr. J. Harvey passed the Hendon tests for his "B" licence.

YAPTON

Rough weather made flying difficult on two or three days, but 35 hours' flying was recorded for the week ended August 21. Messrs. John Parker and J. Lishman made first solos and Mr. W. L. Mayo has passed all the tests for his "B" licence.

HANWORTH

The Leopard was recently taken for a trip to Brighton by two members in spite of the high winds and rain, which caused a drop in the flying times. These were brought down to 95 hours. Mr. L. Green made his first solo flight after only 5¼ hours' dual instruction.

CAMBRIDGE

The members of Marshall's flying school have been concentrating on blind flying, but several cross-country flights have been carried out. The flying total for the week ended August 22 amounted to 71 hr. 35 min. Mr. Dykes has qualified for his Cambridge Pilot's Air Certificate.

SOUTH COAST

In spite of the high winds over 40 hours' flying were carried out last week. The Hon. Chas. Winn and Mr. T. M. G. Bury passed their "A" licence tests. A cross-country flight was made to Devonshire by all the Club machines and by several private aircraft to pay a visit to the chairman, who is on holiday there.

BRISTOL AND WESSEX

Mr. Goodban, who has taken up an appointment in Egypt, was the guest of honour at a farewell party given on Friday, August 20. A total of 114 hr. 20 min. was logged for the three weeks ended August 20. Miss B. Gardner and Mr. I. G. Duncan obtained "A" licences and Mr. H. H. Witts made his first solo.

BORDER

Mr. Barras Wilkinson, aged 91, presented himself for a joyride last week. He thoroughly enjoyed his flight and hopes to go up again soon. The most difficult part for him was getting in and out of the machine. Several cross-country flights were made, Edinburgh, Newcastle and Liverpool being the chief ports of call.

C. A. S. C.

Mr. J. G. Arrow, of 22, Stanthorpe Road, London, S.W.16, has been appointed hon. treasurer; Mr. T. R. Mascall, formerly in this position, is now C.O. All matters having financial bearing should be directed to Mr. Arrow. Members put in eight hours' flying at Cambridge during the week-end, whilst two representatives of the Club were on duty at Heston, where they escorted 130 people round the aerodrome buildings.

BROOKLANDS

An altitude race was held on Sunday. Competitors had to climb as high as they could in ten minutes. Only one machine was used, so those who hoped to see five Tiger Moths hanging on their propellers, all completely stalled, were disappointed. Mr. D. Bradley Watson, who reached 8,000 ft., was announced the winner. Miss Friedlander was second with 7,750 ft. Master Valentine Wigram ought to remember his seventeenth birthday; he made his first solo, spent three hours solo, and passed all his "A" licence tests—in one birthday! The flying times for the week amounted to 121 hr. 30 min.

CINQUE PORTS

Everything is set for the International Rally on August 28 and 29 and, in addition to the Mew Gull and T.K.2 entered in the race, there are two very fast single-seater Caudrons entered by Guy Hansez. There is a considerable increase in acceptances from abroad and it is hoped that everyone connected with British aviation will attend. Flying times for the week totalled 75 hours, and several charter flights were also carried out. Mr. Hackney took the Puss Moth to Ipswich for a day's duck-shooting. Mr. F. Richards made a successful night flight to Croydon from Lympne for his "B" licence.

KARACHI

The high winds and an unusually prolonged spell of heavy rain recently experienced was reflected in the flying times last month, which amounted to 153 hours only, but better weather towards the end of July saw the Club's four Gipsy Moths busily occupied. Twelve members are training for "A" licences and Capt. W. A. Salmon, Messrs. V. B. Chawan and A. D. Cabral have obtained theirs. Nine members are working for "B" licences. Cross-country flying has been in abeyance, but on July 31 two members of the aerodrome staff flew in search of Tata's machine which was forced down by bad weather some twenty miles from Mughalbhim. However, it had managed to proceed on its journey and arrived safely on the same day.

MIDLAND PARTY

HARDLY a single week-end flying event this season has been entirely free from weather difficulties, either in the vicinity of the meeting itself or in other areas—thus effectively preventing private owners and others from swelling the stock of visiting machines. On Saturday, for instance, most of the South of England suffered, during the first part of the day at least, from dangerously low cloud conditions and, intermittently, from the sort of fine rain which makes flying at the necessarily low altitudes both uncomfortable and dangerous.

At Castle Bromwich, however, for the Midland Aero Club's annual At Home, things were not noticeably bad and several pilots managed to get through from the difficult areas. There was, however, little or no sun and the dozen or so visitors might have been doubled if really handsome conditions had prevailed over the whole of the country.

Led by Mr. W. H. Sutcliffe, the chief instructor (who remained at work on starting and finishing lines in the middle of the aerodrome during the entire proceedings and was seen only as a distant labouring figure for a period of three or four hours), the organising committee had done its best to produce a few new ideas and so relieve the monotony of the usual displays, demonstrations and car bombings, while within the clubhouse an expert was engraving the names of those successful in competitions on the many trophies and tankards which were due to be presented by Mrs. Gilbert Dennison later in the afternoon.

The perennial arrival-event, for instance, was coupled with an approach and landing competition so that those who were unlucky in landing at the wrong time stood an equal chance, on sheer merit, of flying away with a useful little trophy. A staunch local pilot of many years' standing, Mr. G. S. Davison, who had flown away in his veteran Monospar in order to arrive according to plan, duly won the former, while Mr. H. Everett, from Leamington, won the latter with his Comper Swift—a very worthy effort in a machine which demands a certain amount of good, accurate flying if it is to be put down neatly on a predetermined spot.

A navigation competition—for the Dunlop Trophy—was the first genuine event of the afternoon. Five minutes before taking off every entrant was given two true bearings, on each of which he had to fly for twenty miles, thereafter returning to Castle Bromwich. The machines were expected to fly at an air speed of 90 m.p.h. and the competitor who crossed the line at a time nearest to his precomputed arrival moment (40 minutes after his start) was adjudicated the winner. Needless to say, two or three of the seven entrants failed to round the observed turns according to plan, having made very slight errors in laying off their tracks, and the event was won by Dr. L. W. Hamp, who arrived five minutes after schedule; Mr. Morris, in a club machine, was second, with an eighteen-minute error. Mr. Everett actually covered the course in forty-two minutes, but he failed to hit off one of the turns—which were arranged near Smitherfield and Rugby so far as could be gathered from non-competitive calculations.

Relay Race

Before the navigation experts had all returned Mr. G. E. Lowdell (once figuring at C.B. as a test pilot for Wolseley engines and now chief of the Sywell reserve school) showed exactly what could be done aerobatically in a Club Tiger without an inverted-flying fuel system. An effective display in his usual style. Mr. J. H. Barringer, Percival's flying salesman, then demonstrated a Vega Gull and Mr. D. M. Bay a B.A. Swallow, and a car was duly bombed.

There were three teams in the Inter-Club Relay Race—one from Tollerton, another consisting of private owners and a third from the club, each with three machines. One pilot from each team flew over the seven-mile course at a time, landed, taxied to the line, stopped his engine and handed his baton to the next starter in his team. If he overshot he still had to stop his engine and manhandle his machine, with the help of other team members, to the line before the next man could take off. The event was won by the Nottingham Aero Club, the pilots being Messrs. J. Birkin, G. Birkin and Capt. Cudmore.

Private Flying

FOR THE KING'S CUP: The redesigned cabin and new moulded windscreen certainly improve the appearance of the Cygnet Major, which is now flying at Hanworth. In the cabin are Messrs. Waddington (nearest the camera) and Wynne-Eaton, who is carrying out the tests. (*Flight* photograph).

Dual to Delhi

A PRIVATE owner, who is due back at Meerut on October 16, is on the look out for a companion who would share the expenses of a trip out there. The machine to be used is a Gipsy I Moth, and the owner would prefer someone with an "A" licence though this qualification is not essential. Anyone who would care to make the trip at that time should write to *Flight*, c/o The Editor.

Ards Rally

ON September 18 a rally will be organised at Ards by the North of Ireland Aero Club. As an initial effort by the club, no very ambitious events are being planned and the organisers are only anxious that those who attend will have a pleasant flight and a good party at the end of it. There will be awards for "arrival," for the pilot flying the greatest distance and for the owner of the machine in the best all-round condition.

In the evening the guests will be entertained to dinner, and a dance is being held at Mountstewart, the home of Lord and Lady Londonderry.

Those who have not previously visited Ulster might take this opportunity of doing so. The modest nature of the arrangements suggests that visitors will have an exceptionally pleasant time.

Lympne International

BOTH the varied entries for the Cinque Ports Wakefield Cup Race and the list of guests for the International Rally at Lympne this week-end suggest that the affair will be an outstanding one.

Among the competitors, for instance, are F/O. A. Clouston and his Damascus race Comet; M. Guy Hansez, who has entered a Caudron 581 and 685, the second of which will be flown by M. Arnaux; Mr. Henshaw's Mew; and Mr. Geoffrey de Havilland's T.K.2—among the faster of the fourteen entrants, and more may have come along by now. There will be two heats for this event.

Aerobatics will be carried out by No. 111 Squadron with a flight of three Gauntlets, by Herr Forster (on his third visit to Lympne), by Mrs. Hutton Rudolph and by Herr Fischer, the last two from Switzerland. There will be a triple parachute drop by Miss Ray Clark and Messrs. de Greeuw and Gwynne Johns.

Mr. Noel Coward, assisted by Lady Peel (Mrs. Lillie), Miss Ruth Chatterton and Miss Jeanne de Casalis, will present the prizes, and on Saturday night there will be a dinner and dance at the aerodrome, during which M. Georges Seversky will conduct an impromptu cabaret.

The Eastbourne At Home

IT has been decided that the cancelled Wilmington "At Home" will be held on Saturday, September 18. The competitions, with attendant trophies, and the general arrangements will be unchanged. Let us hope that the organisers, led by Capt. Short, will have better luck this time.

The Aeronautical Corporation of Great Britain

SHAREHOLDERS in the Aeronautical Corporation of Great Britain, who met on Friday to consider a resolution for the voluntary liquidation of the company, unanimously agreed to adjourn the meeting for fourteen days. The chairman, Major Warren, said that the directors had received two proposals which although not acceptable in their present form should, the board felt, be considered.

The Aeronautical Corporation are, of course, the makers of the British version of the Aeronca cabin monoplane.

Footholds

MORE than one person has fallen on his back as a result of standing (or failing to stand) on the "non-skid" foothold section provided on the wing roots of some machines. No doubt the non-skid properties were present at one time, but in most cases even small use produces an early polish which is most treacherous.

A simple method applied recently to some machines consists of using a metal spray equipment on coarse adjustment and squirting rough nuggets on to a sheet-metal base. The roughness will take a considerable time to wear off, and dampness should have next to no effect.

Another Hungarian Party

THOSE who have appreciated the hospitality of the Magyar Air Picnic will be interested to learn that an International Rally is being held from Lake Balaton, Hungary, between September 9 and 15.

The participation fee for the Rally is 100 P. for every aeroplane. During the two intervening days between arrival and departure on the flight round Hungary the programme consists exclusively of excursions of various kinds. In other words, the intrepid aviators merely arrive some time after 3 p.m. at Lake Balaton on September 9 and ignore their aeroplanes until September 12, when the race starts.

Full details (in five languages) can be obtained from the Rallye Aerien "Balaton," Budapest, V., Vörösmarty-tér 7, but as entries must be received by noon on August 31 we would advise intending arrivals to write at once to say that they are coming over. More immediate details can be had from the Royal Aero Club.

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STRESSED-SKIN CONSTRUCTION

Distribution of Loads on Stringers and Transverse Rings in a Monocoque Fuselage

By W. TYE, B.Sc. (Eng.)*

At the present stage in the development of stressed skin construction, calculations relating to the strength of such construction must necessarily be a mixture of simplified versions of the more complex thin sheet theory, applications of mechanical test results, and a disturbing amount of guesswork. The aim of this paper is to diminish the amount of guesswork required, and to present, in readily usable form, the results of applying thin sheet theory to certain problems arising in the design of monocoque fuselages.

The diagonal tension fields in the metal covering of a monocoque fuselage loaded in shear and bending, or in torsion, throw secondary bending loads on the longitudinal stringers. The stringers are supported by the transverse rings, and, in consequence, the rings receive loads from the stringers and also directly from the skin.

In the following paragraphs the distribution of such loads round the periphery of elliptical section fuselages is considered. The results are given mainly in graphical form for a range of elliptical sections and include the effects of "direct" shear and shear due to torsion. A general expression is given for the load distribution which may be applied to fuselages of any section.

[See also article on this subject by C. Gurney, B.Sc., in *The Aircraft Engineer*, May 27, 1937.—ED.]

INTRODUCTORY.—A fuselage may be subjected to bending and direct shear, in either the vertical or horizontal plane, and to torsion. Pure bending, unaccompanied by shear, causes longitudinal tensile and compressive stresses in the stringers and associated skin. Methods of calculating these stresses are already well known.

Direct shear loads and shear due to torsion are resisted in the thin metal covering by diagonal tensile stresses. The tensile stresses apply loads to both stringers and rings. These loads, when considered in conjunction with the loads due to pure bending, will usually give criteria for the strength of the stringers and rings. It is at once apparent that the distribution of shear across the section of a fuselage must be explored.

Direct Shear. The shear stress at any point in a thin walled shell subjected to bending and shear, in which wrinkling does not take place, may easily be found. In this case the gradation of shear stress across the section is smooth. In practice each panel may be wrinkled, the shear load being taken by diagonal tension. The diagonal tensile stresses are considered to be approximately constant across the depth of each panel. Therefore the stresses, instead of being graded smoothly across the section, will suffer abrupt changes at each stringer. If the stringers are fairly closely spaced it appears justifiable to assume that the general distribution of diagonal tensile stress across the section is the same as the distribution of shear stress in the ideal non-wrinkled shell, and that wrinkling merely serves to equalise the stress across the depth of each panel. (Fig. 1) illustrates this point.

Shear Due to Torsion. It has been shown that if wrinkling does not occur the shear in a thin shell under torsional loading is constant round the section. The assumption is again made that the distribution is unaffected by wrinkling.

Loads Transferred to Stringers and Rings

Fig. (2) represents four panels of a monocoque structure, $A_1A_2A_3$, etc., being stringers, and $A_1B_1C_1$, etc., segments of transverse rings. The diagonal tension fields, assumed to be at 45° to the longitudinal, may be resolved into components parallel to the rings and parallel to the stringers. If the shear is varying across the section the tension in $A_1A_2B_2B_1$ will be different from that in $B_1B_2C_2C_1$.

The component of tension parallel to the ring therefore subjects the stringer to a tangential lateral load, uniformly distributed along its length. Also, since the skin is curved over A B C, the component of tension parallel with the

* The author of this article, who is on the Staff at the Royal Aircraft Establishment, Farnborough, wishes us to state that he is indebted to the Air Ministry for permission to publish the article, and that he takes full responsibility for any opinions expressed or implied.

ring applies a distributed lateral load to the stringer, normal to the surface. The stringers may now be looked upon as continuous beams, supported at the rings and subjected to uniform lateral loading, both tangential and normal to the surface, these loadings in all probability changing from one bay to the next.

The stringers are supported by the rings and therefore apply normal and tangential concentrated loads to the rings at the points of intersection A, B, C, etc.

Considering for the present only loads acting in the transverse planes, the component of tension parallel to the stringers is assumed to apply no load to either stringers or rings. In practice some load is obviously taken directly from the skin into the ring. By resolving the diagonal tension into two components we have made it appear that the whole load passes to the rings, via the stringers.

The effect of thus concentrating the loads at points $A_1B_1C_1$, etc., would appear to be small when the final stresses in the ring or stringer are considered, especially if the stringers have a relatively small pitch.

Application to Elliptical Section Fuselages

Calculations based on the previously mentioned assumptions have been made to obtain the load distribution round elliptical section fuselages. The ellipse was chosen as the simplest mathematical curve conforming with the general shape of rings, but, as will be seen in the Appendix, the general principles apply to any shape.

The following notation will be used (see also Fig. 3):

V	vertical shear at section of fuselage considered.
H	horizontal ,, ,, ,, ,,
Q	torque ,, ,, ,, ,,
$2a$, $2b$	depth and width of fuselage section.
P_r	distance between transverse rings.
P_s	,, ,, stringers.
N	normal load applied by stringer to ring.
T	tangential ,, ,, ,, ,,
W_n	normal distributed load applied by skin to stringer.
W_t	tangential ,, ,, ,, ,,
θ	angle subtended by any stringer to the horizontal axis of the fuselage section (the minor axis of the ellipse).

The above must naturally be in consistent units (e.g., pounds inches). It is shown in the Appendix that the loads N, T, and loading per unit run W_n, W_t are expressible in terms of the externally applied loading, the dimensions of the section, and coefficients which are functions of θ and b/a. The formulæ obtained are summarised below:

Summary of Formulæ

	Normal Loads.	*Tangential Loads.*
Vertical Shear V.	$N = K_{nv} . V . \frac{P_r P_s}{\pi a^2}$	$T = K_{tv} . V \frac{P_r P_s}{\pi a^2}$
	$W_n = K_{nv} . V . \frac{P_s}{\pi a^2}$	$W_t = K_{tv} . V . \frac{P_s}{\pi a^2}$
Horizontal Shear H. :		
	$N = K_{nh} . H . \frac{P_r P_s}{\pi b^2}$	$T = K_{th} . H . \frac{P_r P_s}{\pi b^2}$
	$W_n = K_{nh} . H . \frac{P_s}{\pi b^2}$	$W_t = K_{th} . H . \frac{P_s}{\pi b^2}$
Torque Q.	$N = K_{nq} . Q . \frac{P_r P_s}{2\pi b^3}$	$T = 0$
	$W_n = K_{nq} . Q . \frac{P_s}{2\pi b^3}$	$W_t = 0$

The coefficients K_{nv}, etc., are plotted against θ for a range of b/a values (0.6 to 1.0) in Figs. 4, 5, 6, 7 and 8. Reference to these curves makes it possible to write down immediately the lateral loading on any stringer or the distribution of load round the ring. The distribution round a ring ($b/a = 0.6$) is shown in Fig. (3), the lengths of the arrows being proportional to the N and T forces.

If any of the quantities, such as P_r, P_s, are not constant, mean values may be used. It should be noted that if vertical shear V is applied, the T and W_t forces point towards the $x\,x$ axis, as shown in Fig. (3), while if a horizontal shear H is applied the T and W_t forces point towards the y y axis. The N and W_n forces are always directed inwards.

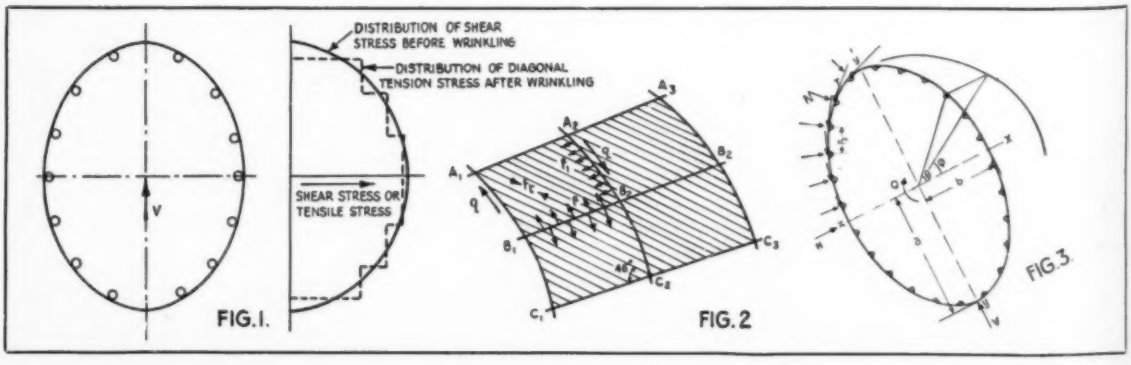
So far the longitudinal component of the diagonal tension has been neglected. It is clear that if the shear in passing from one bay to the next (across $A_2B_2C_2$ in Fig. 2), a load is thrown on the ring normal to its plane. This is resisted by compression end load in the stringers and adjacent skin.

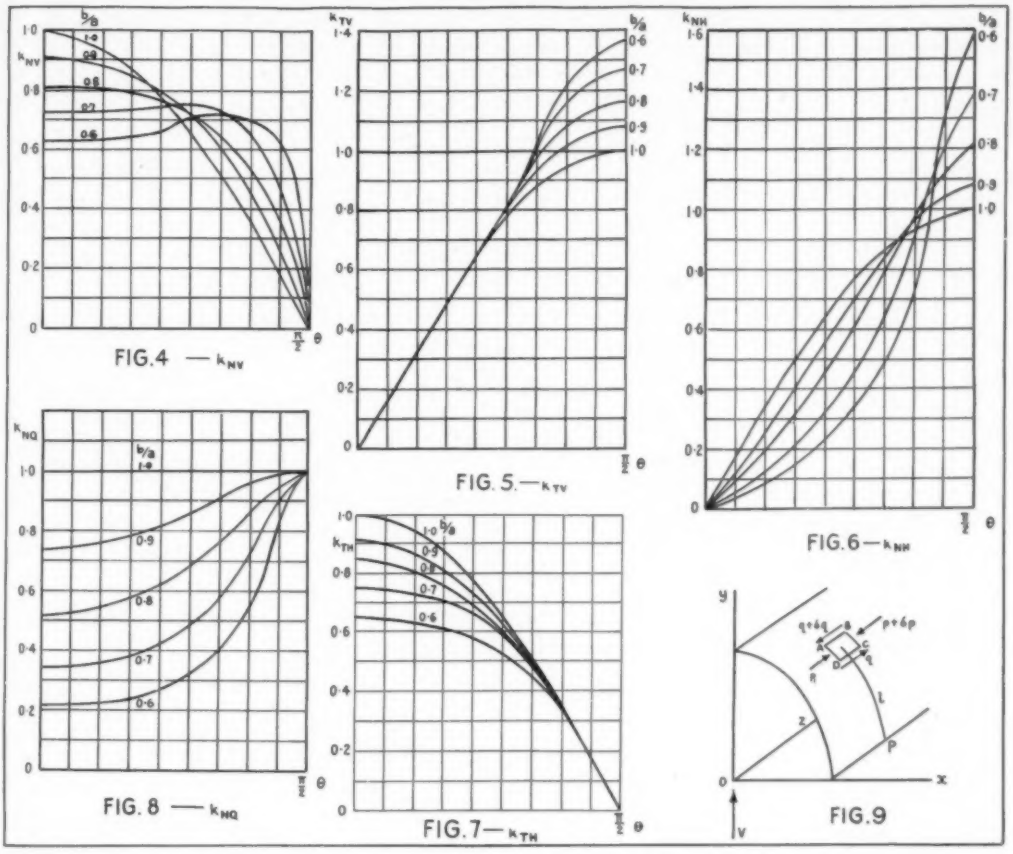
The distribution of diagonal tension (and therefore longitudinal tension) round the section depends upon the external loading, i.e., constant round the section for torsion; varying for direct shear. However, if the rings are rigid to bending in their own plane, whatever the load distribution applied to the rings by the skin, the load taken by the stringers is uniformly distributed round the section, providing the section is symmetrical. Since the additional complication of allowing for flexibility of the ring is considerable, this refinement is not considered to be merited, and the rings are taken as infinitely rigid.

Application to Elliptical Section Fuselages

Using the previous notation, the end load P in the stringer and adjacent skin due to a total shear load V or H, or a total torque Q at any section, is given by one of the following equations:

Vertical Shear V	$P = \frac{2 . V . P_s}{\pi^2 a}$
Horizontal Shear H	$P = \frac{2 . H . P_s}{\pi^2 b}$
Torque Q	$P = \frac{Q . P_s}{2\pi ab}$





CONCLUSION.

Summarising, the loads applied to the stringer consist of

a. End load due to pure bending.

b. End load due to longitudinal component of the diagonal tension field.

c. Bending loads in radial and tangential directions due to the transverse component of the diagonal tension field.

The loads applied to the rings consist mainly of normal and tangential concentrated loads at the intersection of stringer and ring.

Further secondary loads may be present, but for preliminary calculations these loads should suffice to give a rational basis.

The author is indebted to Mr. I. J. Gerard, since many of the ideas included in this paper are the outcome of conversations with him.

Appendix.

(i) *Direct Shear.* Fig. (9) represents a portion of a thin shell of thickness t subjected to a vertical shear load V. In order to determine the distribution of shear stress round the shell consider the equilibrium of a small element ABCD whose position is defined by the co-ordinates x, y, z. Its position is further defined by the distance l between the element and a convenient reference point P, measured round the surface of the shell (P and the element at x, y, z, lying in the same vertical plane).

Summing the forces acting on AB CD in the Oz direction, due to bending stresses p and shear stresses q, gives :

$$\left[p - \left(p + \frac{\partial p}{\partial z} \cdot \partial z\right)\right] t \cdot \partial l + \left[q - \left(q + \frac{\partial q}{\partial l} \cdot dl\right)\right] t \cdot \partial z = 0$$

$$\therefore \frac{\partial p}{\partial z} = -\frac{\partial q}{\partial l}$$

The plane Oxz may be taken to be the neutral surface of the shell when subjected to bending in the plane Oyz. Now if I is the second moment of area of the transverse section of the shell about the Ox axis, and M is the bending moment at a section distant z from the origin,

$$p = \frac{M}{I} \cdot y$$

$$\text{and } \frac{\partial M}{\partial z} = V$$

$$\therefore \frac{\partial p}{\partial z} = \frac{\partial M}{\partial z} \cdot \frac{y}{I} = \frac{Vy}{I}$$

$$\therefore \frac{\partial q}{\partial l} = -\frac{Vy}{I} \quad .. \quad .. \quad .. \quad (1)$$

Integrating equation (1) gives

$$q = -\frac{V}{I} \cdot \int_o^l y\, dl + q_o \quad .. \quad .. \quad (2)$$

where q_o is the shear at $l = o$.

Equation (1) gives the rate of change of shear stress round the section and (2) gives the shear stress at any point whose position is defined by l (or $x.y.z$).

The shear stress q is now assumed to be resisted by diagonal tension fields disposed at 45° to the Oz direction. The tensile stress is given by :

$$F_t = 2_q.$$

The component of the F_t stress in the Oxy plane is given by

$$F = Ft/2$$

$$\therefore F = q.$$

Lateral Loading

It remains to find the lateral loading applied to a short length of stringer ∂z due to the tensile stress F. If ρ is the radius of curvature of the shell at the point x, y, z, the normal load ∂N applied to the stringer is

$$\partial N = q.t \cdot \frac{\partial l}{\rho} \cdot \partial z.$$

The tangential load applied to the stringer is given by

$$\partial T = \frac{\partial q}{\partial l} \cdot t \cdot \partial l \cdot \partial z$$

Substituting from equations (1) and (2) for the stress terms q and $\frac{\partial q}{\partial_l}$ into the above equations, gives ∂N and ∂T in the forms

$$\frac{\partial N}{\partial z} = t \cdot \partial l \cdot \frac{1}{\rho}\left[-\frac{V}{I} \int_o^l y \cdot dl + q_o \right] \quad .. \quad .. \quad (3)$$

and $$\frac{\partial T}{\partial z} = t \cdot \partial l \cdot \left[-\frac{Vy}{I} \right] \quad .. \quad .. \quad .. \quad .. \quad (4)$$

The lateral loading on the stringer is therefore

$$W_n = \left[q_o - \frac{V}{I} \cdot \int_o^l y \cdot dl \right] \frac{Ps \cdot t}{\rho} \quad .. \quad .. \quad (5)$$

$$W_t = \left[-\frac{Vy}{I} \right] Ps \cdot t. \quad .. \quad .. \quad .. \quad .. \quad (6)$$

The loads applied by the stringers to the rings are approximately,

$N = Pr \cdot Wn.$ .. .. (7)

$T = Pr \cdot Wt.$ .. .. (8)

(ii) *Shear Due to Torsion.* By Batho's formula, if A is the area enclosed by the section the constant shear stress is given by

$$q = \frac{Q}{2 \cdot A \cdot t.}$$

$$\therefore \frac{\partial q}{\partial l} = o.$$

Corresponding to equations (5) and (6) we obtain :

$$W_n = \frac{Q}{2A} \cdot \frac{Ps}{\rho} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (9)$$

and $W_t = o$ .. .. (10)

Application

(iii) *Application to Elliptical Section fuselage with Vertical Shear load V.*

Referring to Fig. (3)

$$x = b \cos \phi$$

$$y = a \sin \phi$$

Writing $b^2/a^2 = 1 - e^2$

gives $$\frac{dl}{d\phi} = a(1 - e^2 \sin^2\phi)^{\frac{1}{2}}$$

Now equation (5) may be written

$$W_n = \left[qo - \frac{V \int_o^e y \cdot dl}{4t \int_o^{\frac{\pi}{2}} y^2 \cdot dl} \right] P_s \cdot t \cdot \cdot \cdot \frac{\frac{d^2y}{dx^2}}{\left[1 + \left(\frac{dy}{dx}\right)^2 \right]} 3/2$$

$$= \left[qo - \frac{V}{4at} \cdot \frac{\int_o^{\phi} \sin\phi(1 - e^2\sin^2\phi)^{\frac{1}{2}}\, d\phi}{\int_o^{\frac{\pi}{2}} \sin^2\phi(1 - e^2\sin^2\phi)^{\frac{1}{2}}\, d\phi} \right]$$

$$x \cdot \frac{b \cdot p_s \cdot t.}{a^2\left[\cos^2\phi + (1 - e^2)\sin^2\phi \right]} 3/2$$

The integrals may be evaluated by expanding $(1 - e^2 \sin^2\phi)^{\frac{1}{2}}$ and integrating as many terms of the series as are necessary to obtain the required degree of accuracy. The integrated form is :

$$W_n = \left\{ qo + \frac{V}{\pi at} \frac{\left[1 - \frac{e^2}{2}\left(1 - \frac{\cos^2\phi}{3} \right) \ldots \right] \cos\phi}{\left[1 - \frac{3}{8}e^2 - \frac{5}{64}e^4 \ldots \right]} \right\}$$

$$\frac{b \cdot Ps \cdot t}{a^2\left[\cos^2\phi + (1 - e^2)\sin^2\phi \right]} 3/2$$

It remains to determine qo. Since the shear stress is clearly zero when $\phi = \frac{\pi}{2}$

$$qo = o$$

$$\therefore W_n = \frac{V.P_s}{\pi a^2} \frac{(1-e^2)^{\frac{1}{2}}\left[1 - \frac{e^2}{2}(1 - \frac{\cos^2\phi}{3}) \ldots \right] \cos\phi}{\left[1 - \frac{3e^2}{8} - \frac{5e^4}{64} \ldots \right] \times \left[\cos^2\phi + (1-e^2)\sin^2\phi \right]^{3/2}}$$

$$\therefore W_n = K_{nv} \cdot \frac{V \cdot P_s}{\pi a^2} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (11)$$

where K_{nv} is a function of e and ϕ.

Wt is given by a somewhat simpler expression for

$$W_t = \left[-\frac{Vy}{I} \right] Ps.t.$$

$$= -\frac{V.Ps \cdot \sin\phi}{\pi a^2\left[1 - \frac{3e^2}{8} - \frac{5e^4}{64} \ldots \right]}$$

$$\therefore W_t = -K_{tv} \cdot \frac{V \cdot Ps}{\pi \cdot a^2} \quad .. \quad .. \quad .. \quad .. \quad (12)$$

Where K_{tv} is a function of e and ϕ.

It is convenient to neglect the minus sign in equation (12) since it merely indicates the direction in which the load W_t is acting (i.e., in a direction opposite to increasing values of l).

The coefficients K_{nh} and K_{th} are determined in an exactly similar manner.

Finally ϕ is written in terms of θ.

$$\tan\phi = b/a \tan\theta.$$

Plotting the Curves

Using this relationship the coefficients K_{nv}, etc., are plotted against θ as families of curves, each curve representing a particular value of b/a. It will be noticed in Figs. (5) and (7) that the lower portions of the curves coincide over the range of b/a values plotted. The curves actually vary very slightly in this region, but to avoid confusion the mean line only is plotted, the error introduced being negligible.

(iv) *Elliptical Section Fuselage with Torque Applied.*

The coefficients are readily derived for from equation (9).

$$W_n = \frac{Q}{2A} \frac{P_s}{\rho}$$

$$= \frac{Q}{2\pi ab} \quad P_s \quad \frac{b}{a^2\left[\cos^2\phi + (1 - e^2)\sin^2\phi \right]} 3/2$$

$$= \frac{Q}{2\pi b^3} \quad P_s \quad \frac{.(1 - e^2)^{\frac{3}{2}}}{\left[\cos^2\phi + (1 - e^2)\sin^2\phi \right]} 3/2$$

$$\therefore W_n = K_{nq} \frac{Q.P_s}{2\pi b^3} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (13)$$

From equation (10)

$W_t = o.$

(v) *Particular case of Circular Section fuselage under Direct Shear Loads.*

It is interesting to note that for the circle where $b/a = 1$ equations (11) and (12) become

$$W_n = \frac{VP_s}{\pi a^2} \cos\phi$$

$$W_t = \frac{VP_s}{\pi a^2} \sin\phi$$

Also $\tan\phi = \tan\theta$

The resultant of W_n and W_t is given by

$$W_r = (W_n^2 + W_t^2)^{\frac{1}{2}}$$

$$= \frac{VP_s}{\pi a^2}(\cos^2\phi + \sin^2\phi)$$

$$\therefore W_r = \frac{VP_s}{\pi a^2}$$

The inclination of W_r to the $x\,x$ axis is thus

$$\psi = \theta + \tan^{-1}\frac{W_t}{W_n}$$

$$= \theta + \theta = 2\theta$$

The resultant W_r is therefore constant round the section its direction being inclined at 2θ to the $x\,x$ axis.

(vi) *End Load in Stringers.* The longitudinal component F_1 of the diagonal tension fields is given by

$$F_1 = q.$$

The end load taken by any stringer plus adjacent skin is therefore

$$\frac{P_s \cdot t \int . q \, . \, dl}{\int dl}$$

a/ Direct Shear.

Applying this to elliptic rings subjected to a vertical shear V the end load in a stringer P is given by :

$$P = \frac{V \, . \, P_s}{\pi a}$$

$$\frac{\int_0^{\frac{\pi}{2}} \left[1 - \frac{e^2}{2}\left(1 - \frac{\cos^2\phi}{3}\right) - - -\right]\left[1 - e^2\sin^2\phi\right]^{\frac{1}{2}} \cos\phi \, . \, d\phi}{\left[1 - \frac{3}{8}e^2 - \frac{5}{64}e^4 - - -\right]\int_0^{\pi}\left(1 - e^2\sin^2\phi\right)^{\frac{1}{2}} \, . \, d\phi}$$

$$= \frac{2 \, . \, V \, . \, P_s}{\pi^2 a} \cdot \frac{\left[1 - \frac{5}{9}e^2 - \frac{1}{12}e^4 - - -\right]}{\left[1 - \frac{3}{8}e^2 - \frac{5}{64}e^4 - -\right]\left[1 - \frac{1}{4}e^2 - \frac{3}{64}e^4 - - -\right]}$$

It is found that for a range of e values, 0.6 — 1.0, the above function of e is to a reasonable degree of accuracy equal to unity.

$$\therefore P = \frac{2 \, . \, V \, . \, P_s}{\pi^2 a}$$

In a similar way due to a horizontal shear load H the end load in the stringer is found to be

$$P = \frac{2 \, . \, H \, . \, P_s}{\pi^2 b}$$

b/ Torsion.

The longitudinal component F_1 of the diagonal tension is in this case equally distributed round the section.

$$\therefore F_1 = \frac{Q}{2\,A\,t}$$

The end load in the stringer is thus

$$P = F_1 t \, P_s = \frac{Q \, P_s}{2\pi \, a \, . \, b}$$

$$P = \frac{Q \, P_s}{2\pi ab}$$

TECHNICAL LITERATURE

SUMMARIES OF A.R.C. REPORTS

REPORTS published by His Majesty's Stationery Office, London, which may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester, 1; St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through booksellers.

THE PRESSURE DISTRIBUTION AND FORCES ON THIN AEROFOIL SECTIONS, HAVING SHARP LEADING AND TRAILING EDGES AND MOVING WITH SPEEDS GREATER THAN THAT OF SOUND. By S. G. Hooker, D.Phil., 1851 Senior Exhibitioner, Brasenose College, Oxford. Communicated by Professor R. V. Southwell, F.R.S. R. & M. No. 1721. (18 pages and 11 diagrams.) July, 1936. Price 2s. 6d. net.

When a body moves through the air at speeds greater than the velocity of sound waves are set up and the flow pattern in the air is entirely different from that accompanying the same body moving at sub-sonic speeds. Considering two-dimensional flow past a lenticular shaped aerofoil, having sharp leading and trailing edges, if the section is thin the amplitude of the plane waves set up is very small, and they resemble sound waves, being propagated normal to their wave front at the speed of sound. Such waves, therefore, cut the field of flow obliquely, making the "Mach" angle with the direction of motion of the aerofoil.

The work of Taylor and Maccoll* on the disturbances at the nose of projectiles with conical heads has shown that the Rankine-Hugoniot relations give a remarkably accurate representation of the conditions pertaining to permanent shock waves. The pressure and condition of the air at a sharp leading edge can thus be determined with sufficient accuracy from the strength of the shock wave necessary to turn the air stream into a direction tangential to the surface. This has been done in the present paper and the results show good agreement with Stanton's† work on special aerofoil sections tested in the N.P.L. 3-inch High Speed Wind Tunnel.

* G. I. Taylor and J. W. Maccoll, *Proc. Roy. Soc.*, A, Vol. 139, pp. 278–311.
† Sir T. E. Stanton. R. & M. 1130, 1928.

TURBULENCE MEASUREMENTS IN FLIGHT. By J. E. Serby, B.A., and M. B. Morgan, B.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1725. (7 pages and 3 diagrams.) March 27, 1936. Price 1s. 6d.

The Reynolds number at which the well-known sharp fall in the drag coefficient of a sphere occurs is dependent on the degree of turbulence in the air stream, and the critical Reynolds number (R_C) for a sphere is defined as the value of Vd/ν for which the drag coefficient C_D of the sphere is 0.3. The "sphere turbulence indicator" used in the experiments described in this report, was devised to measure R_C in wind tunnels and in free flight. The principle of the indicator is that a sphere and a disc (set normal to the air stream) are carried on spindles fixed at either side of a balance arm (Fig. 1) so that when the apparatus is set up in an air stream the drags of the sphere and the disc are opposed. The area of the disc is chosen so that its drag balances the drag of the sphere when the latter has a drag coefficient of 0.3, i.e. at the critical Reynolds number as defined above. A 6-in. diameter sphere gave a convenient speed for flight tests, and wind tunnel tests showed that a 3.2-in. diameter disc was needed to balance the sphere when the drag coefficient of the latter was 0.3.

In gliding flight R_C the critical Reynolds number at which the sphere drag coefficient C_D is 0.3 was found to be 3.54×10^5. This agreed (within the order of accuracy of the experiments) with the Reynolds number at which the static pressure immediately behind the sphere equalled the static pressure in the undisturbed stream. The value of R_C was decreased by vibration when the engine throttle was opened, the biggest reduction being about 10 per cent. at full throttle on the climb. This effect of vibration may have a bearing on all measurements in flight or in tunnels where the flow is critical. It may be important in wind tunnel work to ensure that the model is held steady to avoid false values of drag and max. C_L. The value of R_C agrees closely with that found in free flight tests in America.

AN ANALYTICAL COMPARISON OF MODEL AND FULL SCALE SPINNING EXPERIMENTS ON A BRISTOL FIGHTER. By R. P. Alston, B.A., and J. Cohen, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1726. (14 pages and 13 diagrams.) March 3, 1936. Price 2s. net.

The R.A.E. Free Spinning Tunnel was brought into use in 1932 to examine the spinning properties of various existing and projected designs of aeroplanes as well as to assist in a general programme of spinning research, and it was desirable to make some comparison with full scale results. At that time detailed measurements of full scale spins had been made on a Bristol Fighter only, though there was a certain amount of less detailed information on a few other types; it was therefore decided to make tests on a Bristol Fighter model for comparison. These tests would really be an extension of the dropping tests already made in the balloon shed,[1] which had indicated that two types of equilibrium spin were possible on the model. It was therefore anticipated that the results of further tests might not be conclusive.

The free model tests described in this report were made in the summer of 1933, but the results of rolling balance tests at the N.P.L. were not immediately available.

Full scale tests had been going on for a number of years before 1932 on the Bristol Fighter, the time being mostly spent in the development of instruments suitable for the work. The first report on this work in which measurements of incidence, rates of roll, pitch and yaw, sideslip and rate of descent were quoted, was R. & M. 1261 by Wright.[2] The chief feature of the results quoted in that report was the vagueness of equilibrium incidence even after several turns: the incidence ranged from 29° to 53°. In later experiments[3] by Stephens on the same aeroplane this vagueness of equilibrium was not found and it was suggested that all the spins of R. & M. 1261 would have settled down to one at about 50° incidence if prolonged in duration. The latter experiments were, however, made after a number of small modifications to the aeroplane, and there appears to be no reason for neglecting the earlier results in considering possible, though not necessarily final, incidences of equilibrium.

The results of the rolling balance tests were found to be invaluable as affording a connecting link between the model and full scale free spinning results. In the case of the Bristol Fighter considered, a number of peculiar features was found; in the model and some of the full scale tests the incidence for spinning equilibrium was not unique, and the design appeared extremely sensitive to yawing moment variations.

Most of the peculiarities noted above were explained by the analysis which suggested that the spinning moment due to rate of spin (wind axis $\overline{p}$) on the full scale aeroplane might have either of two values, only one of which occurs on the model. The analysis further suggests that the model could be made to repeat the full scale behaviour by the application of a combined rolling and yawing pro-spin moment.

REFERENCES.

[1] Stephens: "Free flight spinning experiments with several models." R. & M. 1404. April, 1931.

[2] Wright: "Experiments on the spinning of a Bristol Fighter aeroplane." R. & M. 1261. May, 1929.

[3] Stephens: "Spinning of a Bristol Fighter." R. & M. 1515. July, 1932.

THE EFFECT OF BLADE TWIST ON THE CHARACTERISTICS OF THE C.30 AUTOGIRO. By J. A. Beavan, B.A., and C. N. H. Lock, M.A., of the Aerodynamics Department, N.P.L. R. & M. No. 1727. (28 pages and 10 diagrams.) April 3, 1936. Price 4s. net.

An analysis of the blade motion and force characteristics of the standard Cierva C.30 autogiro rotor is made, taking into account the torsional flexibility of the blades. The results are applied to the steady motion and pitching equilibrium of the whole machine.

The blades are found to twist to the extent of several degrees, in the sense that the mean pitch angle (at any radius) round the circle is decreased and that superimposed on this there is a periodic variation. Both effects increase with the forward speed until at the highest speed the outer portion of the advancing blade is twisted to below the no-lift angle of the section.

As a result of thus taking torsional flexibility into account the axial thrust of the rotor corresponding to the observed rotational speed is reduced to a more nearly constant value, which is dependent upon the mean profile drag coefficient assumed. At the same time the longitudinal force is reduced by 40 to 60 per cent., but the final lift/drag ratio is not affected very appreciably, being decreased by only some 8 per cent. at its maximum.

Applying the results to the motion of a complete machine much better agreement is now found with the experimental values obtained for incidence and stick position in gliding tests at the R.A.E., Farnborough. In particular, the somewhat anomalous reversal of stick position at the higher speeds is predicted.

NOTE ON WIND TUNNEL TESTS ON A PARASOL MONOPLANE WITH ZAP AND SPLIT FLAPS. By J. H Hartley, B.Sc., and W. H. Curtis, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1728. (14 pages and 6 diagrams.) May 11, 1936. Price 2s net

Full scale flight tests have been made on a Parasol monoplane with a Zap flap of 28½ per cent. chord ratio carried right across the wing except for a section cut away at the centre of the wing; and also with a split flap of 10 per cent. chord ratio and 90° deflection carried across the central half span, and situated at 0.38c forward of the trailing edge. Model tests have been made at a low Reynolds number (0.3×10^6) to see to what extent model tests agree with full scale. The model tests have also been used to find the effect of cutting away the central portion of each flap (0.13b).

The effect of either type of flap on profile drag and elevator setting to trim is correctly indicated by model tests; the lift due to the flaps is overestimated by the model at incidences below stall. The model stalls earlier than the full scale aeroplane, and thus fails to indicate the effect of the flaps on maximum lift coefficient.

The effect of removing the central section of either flap on the model without tail plane is to reduce the lift and drag roughly proportionally to the reduction in flap area; the downwash at the tail plane is considerably reduced by central cutaway.

WIND TUNNEL TESTS OF HIGH PITCH AIRSCREWS, PART II. VARIATIONS OF BLADE WIDTH AND BLADE SECTION. By C. N. H. Lock, M.A., and H. Bateman, B.Sc., of the Aerodynamics Department, N.P.L. R. & M. No. 1729. (40 pages and 13 diagrams.) October 28, 1935. Price 5s. 6d. net.

In a previous report, R. & M. 1673, there is described a series of tests on a family of model airscrews of 3-ft. diameter covering a wide range of pitch variation, viz., from P/D 0.3 to 2.5. The main series of tests there described is confined to 2- and 4-bladed airscrews of standard blade widths, plan form and shape of sections (R.A.F.6 type, 11 per cent. thick at 0.7R). The present report contains the results of tests of a miscellaneous series of model screws chosen so as to determine the effect of variations of blade width, number of blades, plan form and shape of section.

The simplified graphical method makes it possible to calculate rapidly from the lift and drag curves given in this report, the performance of an airscrew of any number of blades (2, 3, 4 or 6), blade width and pitch ratio (within certain limits) whose plan form and blade sections resemble those of a model in any of the above groups.

The main conclusions from the analysis of lift and drag curves are as follows:—

With slight exceptions the performance above or below the stall depends only on the width, pitch and shape of a blade section at radius 0.7 so far as the tests extend. Below the stalling angle the performance of a screw is almost independent of the shape of section since the lift depends only on the no-lift angle, while the variations of drag, are not very important, especially for high pitch screws.* The "Joukowski" blades show a lower drag at low lifts than the R.A.F.6 blades while the "Goldstein" blades have a still lower minimum C_p (0.008) corresponding to a maximum efficiency of 93, which is 3 per cent. higher than that of any other screw tested.

Above the stall the performance of any screw within the same limits can be calculated, provided that allowance is made for the shape of blade section and blade width. The lift above the stall, deduced by this method, increases with blade width, but is independent of number of blades. The lift above the stall of the Joukowski and Goldstein blades (with R.A.F.31 type sections) is less and the drag greater than that of the family blades with R.A.F.6 section. The lift of two "Schneider screws" (Group 6: thin R.A.F.6 type sections) is similar to that of the family above the stall, but the drag is greater.

These conclusions refer entirely to model tests, but they might be checked by a similar analysis of results for full scale airscrews.

THE FLIGHT OF A HELICOPTER. By H. B. Squire, M.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1730. (24 pages and 20 diagrams.) November 28, 1935. Price 3s. 6d. net.

Previous reports *† have dealt with the vertical ascent and the horizontal flight of a helicopter. The present report extends the analysis to the case of the flight of a helicopter with a single airscrew (or with two coaxial airscrews rotating in opposite directions), the axis of which is tilted to give the necessary propulsive force for horizontal flight.

General equations, analogous to those given previously, are obtained. Solutions of these are given in the form of charts, which enable the characteristics and performance of a helicopter of given weight, power, blade area, solidity, and tip-speed, to be calculated rapidly.

By equating the work done against drag and gravity to the work done by the airscrew an energy equation is obtained which gives an alternative method of calculating the maximum horizontal speed and the best rate of climb.

The method of solution is illustrated by calculation of the performance of a helicopter similar to the C.30 autogyro at sea level and at 5,000 ft.

The author's conclusions are as follows:—

For a helicopter airscrew of given blade-loading and tip-speed the solidity should be as low as possible, to minimise the induced drag. The tip-speed must be high in order that the ratio of forward speed to tip-speed shall not be too large when the helicopter is flying at its maximum horizontal speed. The blade angle should be easily adjustable in flight. The energy equation shows that the performance at small angles of climb of a helicopter would be the same as that of a similar gyroplane if the efficiency of the gyroplane propulsive airscrew were unity. This comparison neglects the extra weight of the reduction gearing of the helicopter and is, therefore, too favourable to the former.

An estimate is also given of the performance of a helicopter similar to the C.30 autogyro.

* Glauert. Vertical ascent of a helicopter. R. & M. 1132, November, 1927.

† Glauert. Horizontal flight of a helicopter. R. & M. 1157, March, 1928.

NOTE ON THE EFFECTS OF LANDING FLAPS ON STABILITY AND CONTROL. By S. B. Gates, M.A. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1732. (6 pages.) May 25, 1935. Price 1s. net.

The results of recent handling trials of six flapped aircraft are collected and discussed in these notes. The influence of landing flaps on trim and on control at slow speeds is not as serious as might have been expected from model tests.

A NEW FORM OF DASH POT WITH A LARGE RANGE OF DAMPING. By A. S. Halliday, B.Sc., Ph.D., D.I.C., of the Aerodynamics Department, N.P.L. R. & M. No. 1733. (2 pages and 2 diagrams.) September 29, 1936. Price 9d. net.

The dash pot was designed for use on the whirling arm balance where the ordinary open type could not be employed.

It functions in any attitude and is more satisfactory in use than the ordinary plunger or vane type. The damping may be varied from a small amount to infinity without affecting the sensitivity or zero position of the balance.

NOTES ON THE OPTIMUM STIFFNESS OF THIN SHELLS. By H. Roxbee Cox, Ph.D. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1737. (1 page.) April 8, 1936. Price 6d. net.

This paper, of which the R. & M. is an abstract, was published in *Aircraft Engineering*, Volume VIII, No. 91, September, 1936, under the title—"Stiffness of Thin Shells. Brief Notes on the Optimum Stiffness obtainable for a given weight of material."

BOUNDARY LAYER GROWTH. By S. Goldstein, Ph.D., and L. Rosenhead, Ph.D. R. & M. No. 1738. (2 pages.) October 18, 1935. Price 6d. net.

This paper, of which the R. & M. is an abstract, was published in the *Proceedings of the Cambridge Philosophical Society*, Volume 32 (1936), pages 392–401.

NOTE ON THE VELOCITY DISTRIBUTION IN THE WAKE BEHIND A FLAT PLATE PLACED ALONG THE STREAM. By L. Rosenhead, Ph.D., D.Sc., and J. H. Simpson, B.Sc. R. & M. No. 1739. (2 pages.) December 3, 1935. Price 6d. net.

This paper, of which the R. & M. is an abstract, was published in the *Proceedings of the Cambridge Philosophical Society*, Volume 32 (1936), pages 385–391.

ROLLING EXPERIMENTS ON A "PUSS MOTH" MODEL. By A. S. Batson, B.Sc, J. H. Warsap and H. J. Gummer, of the Aerodynamics Department, N.P.L. R. & M. No. 1743 (5 pages and 3 diagrams.) May 16, 1936. Price 1s. net.

The results of sideslip experiments on a tenth-scale model of this machine have already been given;* the work has been continued in this report, which gives the rolling and yawing moments on the same model due to rolling about a wind axis.

Rolling moments about a wind axis and yawing moments about an axis normal to the wing chord were measured over a range of incidence −1.7 deg. to 28.0 deg. at a speed of rotation, about a wind axis, up to $\frac{pb}{2V} = 0.16$. In general the results which have been given with reference to wind axes only, do not differ considerably from those of similar work on other models. The change-over from rolling stability to instability occurs at about 16 deg. incidence.

* A. S. Batson. Forces and Moments on a Puss Moth Model. R. & M. 1631 (Part II).

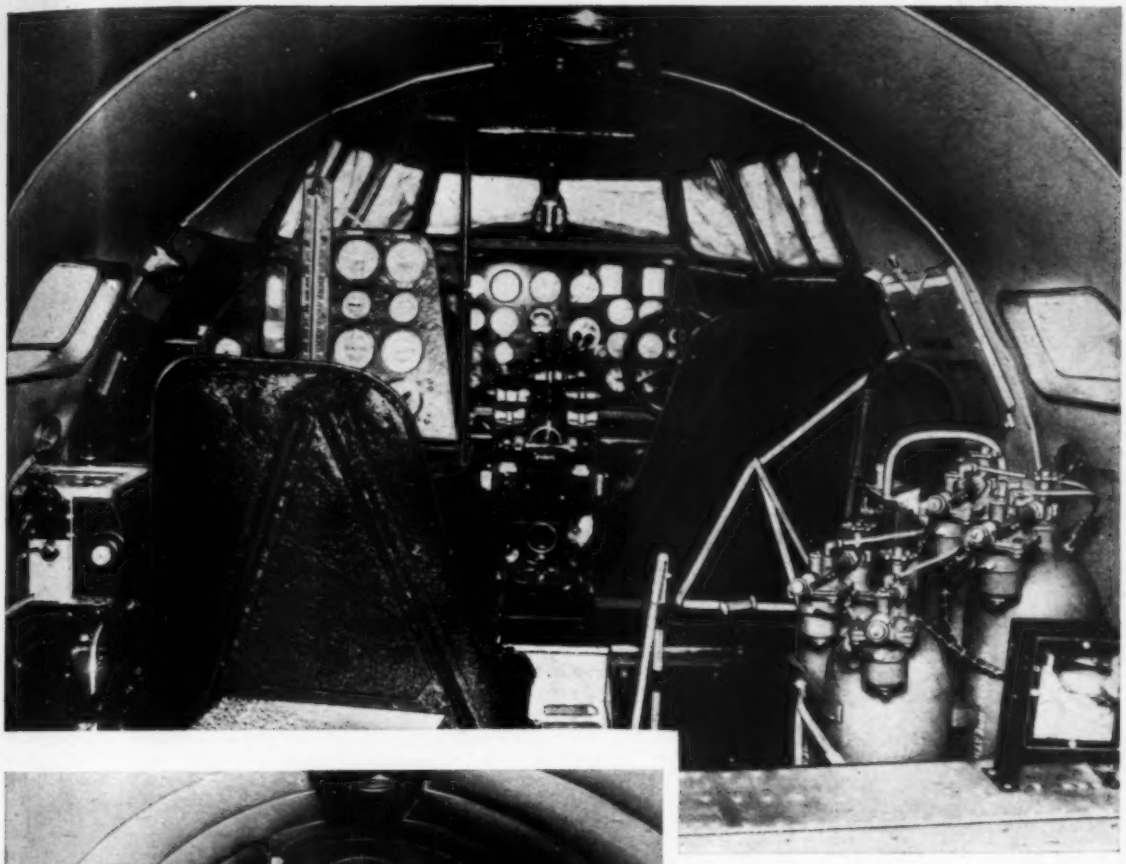
ON THE STATIC PRESSURE IN FULLY DEVELOPED TURBULENT FLOW. By A Fage, A.R.C.Sc. R. & M. No. 1745. (4 pages and 1 diagram.) December 28, 1935. Price 9d. net.

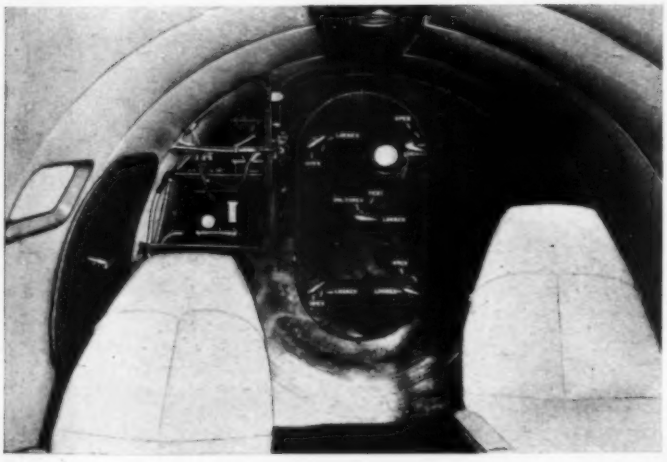
The investigation described in some detail in this abstract had a twofold purpose: first, to obtain a measure of the effect of fully developed turbulence on the reading of a static pressure tube; and second, to obtain information on the distribution of static pressure in the fully developed turbulent flow in a pipe and in the wake behind a long cylindrical body.

The full paper was published by the Royal Society in their Proceedings, Series A, Vol. 155, pp. 576–596.

CALIBRATION OF STANDARD PITOT-STATIC HEADS IN THE HIGH-SPEED TUNNEL. By C. N. H. Lock, M.A., and W. F. Hilton, Ph.D., A.R.C.Sc., of the Aerodynamics Department, N.P.L. R. & M. No. 1752. (3 pages.) August 11, 1936. Price 9d. net.

A standard type of airspeed indicator (Mark VA) as well as two other types of static tube have been tested in the N.P.L. high-speed tunnel up to a speed equivalent to 540 m.p.h. at ground level. At this speed the effect of compressibility on the static reading is negligible and it is only necessary to apply the ordinary correction for the effect of adiabatic compression to the pitot side.





SUB-STRATOSPHERE EXPERIMENT

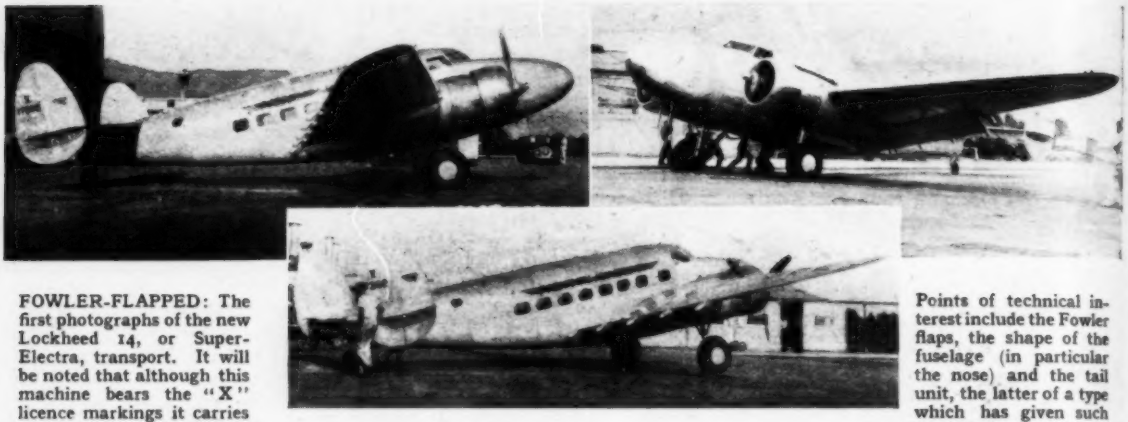
The Heart and Brain of the U.S. Army Air Corps' New Lockheed

WITH a view to collecting data on the operation of long-range aircraft at extreme altitudes the U.S. Army Air Corps has acquired a special Lockheed monoplane based on the Electra. A flying view appeared in *Flight* last week. The engines are believed to be Pratt and Whitney Wasps and have turbo-blowers.

The upper view on this page shows the cockpit at the forward end of the pressure cabin with the emergency oxygen supply on the right.

Immediately above may be seen the special door in the rear bulkhead, while the lower right-hand view reveals some of the controls and dials on the technician's panel.

COMMERCIAL AVIATION



FOWLER-FLAPPED: The first photographs of the new Lockheed 14, or Super-Electra, transport. It will be noted that although this machine bears the "X" licence markings it carries the insignia of Northwest Airlines.

Points of technical interest include the Fowler flaps, the shape of the fuselage (in particular the nose) and the tail unit, the latter of a type which has given such encouraging results on the Electra and "12."

THE WEEK AT CROYDON

A.B.A. Comes Through : Queues : Shanghai Express : Free Balloon : Fauna

LAST week, on Wednesday at 16.45, the first regular A.B. Aerotransport machine arrived at Croydon, piloted by Mr. Linder and having aboard Capt. Carl Florman, managing director of the Swedish company, with Mr. Hans Ostelius, representative of A.B.A. in London. The machine was SE-BAA, a Douglas D.C.3, differing only from those of K.L.M. in being powered by two twin-Wasp engines instead of Cyclones.

As this service, the Scandinavian Air Express, has been in operation as a mutual K.L.M.-A.B.A. affair for about thirteen years, and as K.L.M. are looking after A.B.A. interests here in England, Capt. Florman was welcomed by the English K.L.M. representatives, Capt. Spry Leverton and Mr. C. Kauffmann. Last week, in mentioning this matter, the accidental omission of the words "every other day" gave the impression that A.B.A. were operating this line every day. This is not so, the big idea being that an alternate K.L.M. and A.B.A. Douglas D.C.3 shall run through all the way from Stockholm to London.

Shooting Practice

If you indulge in shooting you naturally select a spot where there is plenty of game. That is what the War Office has just done on one of the accredited air routes which has been long established. A vast "danger area" right on the course of commercial aircraft has been selected and absolutely no other place in the kingdom will do. When firing, which takes place at irregular intervals, is in progress it is dangerous to a pilot, his crew and the passengers (including women and children) to fly over the area, and in certain circumstances it may be very difficult for a pilot to avoid it.

Unhappily we have no influential ornithological friends (and no other logical argument applies) to prevent the military from going gunning after air liners, in the same way in which powerful folk stopped them from interfering with the sacred swans of Chesil Bank. The vital necessity of establishing a danger area at this particular place is not, of course, disputed, but the proceeding is very like mining a stretch of water in the Channel which is regularly used by shipping.

On Saturday, at about 1 p.m., in the Main Hall there was a queue from the passport inspection table practically all across the Hall to the main doors. There were two Imperial machines, two of Air France and one of K.L.M. all fully booked—about a hundred passengers all clamouring to get through the eye of a needle. Passport people at Croydon are extremely obliging and quick at their job but the powers that be at the Home Office in London are slow to appreciate the growth of air transport and to provide adequate staff. I can never remember exact dates but the eighteenth anniversary of the beginning of civil aviation is about due. One is expected to trot out the names of the pioneers and say what wonderful days those were, and all that, every year, but the past is chiefly valuable because of the mistakes we all made and now know better than to repeat.

There were great rumours, though I think nothing came of it, of the organisation of a special air "Shanghai Express" owing to demands from people who wanted to get out there quickly. It was said that K.L.M. would run an extra D.C.3 as far as Karachi, where passengers could transfer to the regular machine and travel to Singapore, where they would transfer from K.L.M. to K.N.I.L.M. who were prepared to run a special to Hong-Kong. There should be no difficulty about return loads.

Talking about mining the shipping routes, a balloon was allowed to escape from Cardington last week and drifted merrily athwart various air routes, the sting being in the tail in this case, for there was about 900 feet of steel cable trailing behind. It is understood that handsome apologies for thus jeopardising commercial aircraft are being prepared and will shortly come to hand. That sort of thing is vastly amusing—until the cable one day comes into contact with a commercial aeroplane. A good idea would be for Cardington and the danger area fiends to combine. Cardington could loose its gas bags and the artillery could (if they hit them) shoot them down.

An Imperial Airways' boat captain, up from Southampton, told me how lately on one sunny morning three porpoises came gambolling round one of the boats, obviously asking it to come and play. The local porpoises look like receiving the same sort of nasty look given to our airport pigeons not long ago.

Other airport fauna are in the news, too, for a passenger recently reported that his machine put up a hare at Croydon, another at Amsterdam, a third at Hamburg and a fourth at Copenhagen. He marvelled that hares should exist at Croydon, surrounded as it is by houses. There always have been hares and partridges on the aerodrome and, incidentally, there used to be nightingales in Plough Lane some years ago.

A. VIATOR.

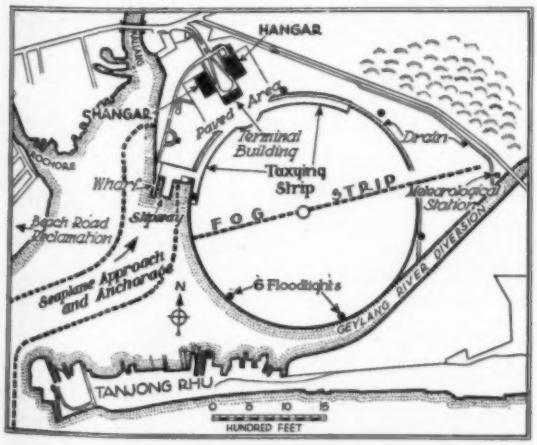
FAR EAST TERMINUS

Singapore's Land-Sea Airport Described : A Modern Layout for Modern Conditions

WHEN H. E. Sir Thomas Shenton Whitelegge Thomas, the Governor of Straits Settlements, opened Singapore's land and sea airport on June 12, it could fairly be said that the world's most up-to-date flying centre was ready for action. There are other land-sea airports, notably at Shushan, New Orleans, but none can be more complete or more important as a junction in the world's airways.

It is all the more interesting, therefore, to know that this civil airport was reclaimed from a shallow tidal swamp which would, in any case, have eventually needed such attention in the interests of public health, and that the site itself is within walking distance of the centre of the capital. In all, some 260 acres have been reclaimed, the work on which was started as long ago as 1931 under the auspices of the Public Works Department. The project was originally sponsored by Sir Cecil Clementi, the Governor at that time, and Mr. R. St. G. Caulfeild, as Resident Engineer, made a tour of Europe's air centres before the real work was begun.

The area actually lies in a basin formed by three streams, and the first job was to canalise the Geylang River. Bores were then sunk in order to test the substrata, and the landing area was enclosed, drained, dried and filled, a tremendous undertaking in itself, and one which helps to explain the comparatively high all-in cost of the airport—a matter of a million or more. In order to cope with the rainfall of the district



This plan of Singapore's airport shows both the layout of the 1,000-yard-run landing area with the six floodlights, and the way in which the Geylang River has been diverted. Singapore itself lies on the west side.

The layout of the terminal building and of the two hangars at Singapore can be seen in the aerial view above. The two telescopic canopies may be seen on either side of the control tower, a close-up of which is reproduced on the left.

the grassed aerodrome surface was arranged in the shape of a flat dome, circular in plan, with a gradient of 1 in 160 from the perimeter to the centre; below the surface there are forty miles of subsoil drains. The diameter of the area is 1,000 yards.

Apart from the obvious necessity of grouping the buildings as far as possible, the nearness of the airport to the city meant that special care had to be applied to their architecture. The terminal building is a two-floor rectangular affair with a central cylindrical control tower. The kernel of the building is a lofty main hall. Around it are offices on the ground floor for the transport companies as well as a post office and the usual telephone booths and shop. At one end of the building is a restaurant with a large roof verandah, while at the other are the passport, medical and Customs offices arranged for the convenient passage of ingoing and outgoing passengers. Telescopic canopies are arranged at the departure and arrival doors, while a third entrance at the base of the control tower is for the use of the pilots and airport staff. On the first floor there are offices for the airport and meteorological staff as well as bedrooms for the use of transport pilots.

Radio and Lighting

Reached by lift from the ground floor, the control tower is 50 feet above the ground and commands a complete view of the aerodrome and of the seaplane anchorage and slipway. The radio operators are in immediate proximity to the control officers, remote control being arranged both for the transmitting station and for the Marconi-Adcock D/F aerial system which lies some two miles away.

In the tower, too, are the switches for the aerodrome and general floodlighting, the whole of the equipment for which has been supplied by G.E.C. Apart from the boundary, obstruction and anchorage lights, an illuminated wind tee and a Neon beacon, there are vapour lamps for general illumination around the hangars, approach road and terminal building, and six fan-cooled aerodrome floodlights laid out on the perimeter. One of these, on the western boundary, can be rotated to illuminate the seaplane channel.

On either side of the apron there are asphalt taxying strips, 100 feet wide, extending in all for about a third of the perimeter of the aerodrome. Behind and on either side of the terminal building there are two 300ft. × 150ft. hangars with two-floor annexes and special approach roads. There are sites for two further hangars at the extremities of the apron, while on the west side of this apron there is an up-to-date fire station.

Commercial Aviation

The seaplane slipway and wharf lies beside the western edge of the landing area, two hundred yards or so from the main buildings. A hundred feet wide, the end of this slipway is submerged to a depth of five feet at extreme low water, and four lines of rails, laid flush in the concrete, are available for hauling flying boats up to the apron extension. In due course a hangar will no doubt be erected at the head of the slipway.

There is about a mile of dredged channel between the slipway and the open sea. This channel, which is 600ft. wide and six feet deep at low tide, is flanked on either side by a timber boom designed to keep out floating débris. This is suitably illuminated at night. Previously chief instructor of the Kuala Lumpur Club, Mr. A. Newark is in charge of the airport.

And now for the first of the through-to-Australia flying boats.

Mail to Switzerland

SINCE last Monday letters and postcards have been sent by air to Switzerland and vice versa without the usual surcharge—which is becoming less and less usual.

Co-operation

LT.-COL. A. J. MUIRHEAD, the Under Secretary of State for Air, should by now have reached Mombasa by Imperial Airways. There he is meeting Mr. Pirow, the South African Minister of Defence and Railways, in order to discuss air transport arrangements in Africa. Lt.-Col. Muirhead is accompanied by Sir John Maffey, of Imperial Airways, and he will make a tour of R.A.F. stations in Egypt, the Sudan and Iraq before returning to this country.

Scottish Merger

DURING the past three months or so negotiations have been proceeding in the matter of an important airline merger in Scotland. Two new companies, Scottish Airways and Western Isles Airways, have recently been formed, and they will have complete control of the principal Scottish air routes under the merger. The L.M.S. and David MacBrayne, Ltd., of Glasgow, will have an interest in these groups. Northern and Scottish can now, presumably, be considered as Railway Air Services and possibly Highland Airways will be absorbed in due course. While internal air transport is fighting for a hold, such pooling of resources, as the Maybury Committee suggested, appears to be the only logical course.

Atlantic Routine

ON Saturday *Caledonia* made the Botwood-Foynes crossing of the Atlantic in 11 hours 33 minutes, taking just three minutes longer than Griffin and Mattern, who made the fastest crossing in 1932. This completes three two-way experimental Atlantic flights. Before her next crossing *Caledonia* will make a tour of selected coast resorts.

The hard-worked *Clipper* III has now completed her New York-Bermuda-Azores-Lisbon crossing and the Blohm and Voss *Nordmeer*, as reported in last week's issue, her crossing over the same route in the other direction.

Medium-wave Beacons at Croydon

AT the beginning of this week the new medium-wave radio beacon came into experimental action. A frequency of 355 k/cs (845 m.) is used so that any normal receiver or homing equipment can be used to pick up the signals.

The beacon provides four equi-signal sectors lying on 49 deg.-57 deg., 139 deg.-147 deg., 229 deg.-237 deg., and 319 deg.-327 deg. In the larger intermediate sectors, dashes will be heard to the north and south of Croydon, and dots to the east and west. The transmission is, for the present, continuous between 09.00 and 16.00 hours on week-days.

This beacon should help to relieve the operator on the controlled-zone equipment since, once the approaching machine has received permission to come in, there should be no necessity for receiving further QDMs from the control tower. A very necessary adjunct, in fact, to the short-wave beacon.

OBSTACLE RACE

ON the river Nile at Malakal, the terminal port for the Imperial Airways flying boats in the Anglo-Egyptian Sudan, large islands of floating papyrus (Cyperus Papyrus) and Um Soof (Vossia Procera) are encountered between May and September. This seasonal scourge is caused by the fact that the floods from the great lakes loosen the roots of the vegetation in the swampy areas farther south. Eventually, large sections break away from the main mass and drift slowly downstream, a menace to flying boats. The photograph above shows *Canopus* safely moored with the floating islands drifting past, while that on the right gives some idea of the size of these islands and of the tug required to shepherd them to the bank.

THE A.R.B. in ACTION

Airworthiness Certificates and Ground Engineers' Licences Already Being Renewed by the Air Registration Board

BY now it would seem probable that all but aircraft owners and those who are intimately concerned with the construction and maintenance of these machines have forgotten the existence of the Air Registration Board. The fact is, of course, that the Board has been forging ahead according to plan and that there have been neither difficulties nor tremendous advances on which to report.

From its quarters at Brettenham House, Strand, the Board is now dealing with Certificate of Airworthiness renewals and with the issue of ground engineers' licences. Very shortly it will be taking over much of the work carried out by the Airworthiness Department at Farnborough and will be issuing certificates of airworthiness for all civil machines up to the ten-seater size. Curiously enough, one of the difficulties seems to be that of obtaining the services of the right men to act as inspectors and so forth, though the permanent staff is steadily increasing week by week. In due course the Secretary of State for Air will be confirming the appointment of the chief of design requirements staff; then the Board will be carrying out all the duties for which it was formed.

The permanent staff at Brettenham House is led by Mr. P. R. Thomas (secretary), who was previously with Lloyds, Mr. James Norman (principal surveyor), and Mr. Haselden Lewis (surveyor in charge of G.E.'s Licences).

For many years people inside and outside the industry have been demanding "freedom" for civil development. We now have it, and the Board should be able to deal with its work without the almost inevitable delays resulting from a really large departmental system. C. of A. renewal applications have still to be made through the Air Ministry, but once the staff of the A.R.B. is put on the job, the work of inspection and recommendation is covered in a matter of a few days.

Save in the case of machines used for "hire or reward"—including club aeroplanes—there is no need for anyone to obtain a Certificate of Airworthiness for his machine, but the Board hopes (for the sake of the movement, if for no other reason) that constructors and others will not take their freedom too seriously! It will certainly be a bad thing if people start to take structural chances and if, consequently, a few lives are lost through failure. Already there are signs of cold feet in quite high places, and it seems probable that few manufacturers will attempt to manage without such a useful recommendation as the British C. of A.—particularly now that the delayed-action fuse is being taken out of the machinery.

For the benefit of those who have not been in close touch with such matters, the names of the members of the complete Board are as follows:—

Sir Maurice Denny, Bt., C.B.E. (Chairman); Messrs. E. L. Gandar Dower, L. T. H. Greig, H. E. Perrin and G. E. Woods Humphery, representing aircraft operators and owners; Messrs. G. H. Handasyde, F. Handley Page, H. N. St. V. Norman and C. C. Walker, representing the constructors; Capt. A. G. Lamplugh, and Messrs. E. R. H. Hill, L. Murray Stewart and A. J. Whittall, representing insurance interests; and Mr. Guy F. Johnson, Sir Laurence Philipps, Bt., Capt. R. H. Stocken and Major R. H. Thornton as "independents." A fairly representative list, it must be admitted.

Airwork and Heston

DURING the past few weeks a number of rumours have been current to the effect that the probable Government ownership of Heston will affect the position of Airwork, Ltd. Actually, neither their business nor address will be affected by the negotiations which are now being concluded. Business, in fact, will be as usual.

Almost Arctic

AN innovation to be tried out during the coming winter season will be new airline between Åbo and Petsamo on the Arctic Ocean. The trip will take five to six hours. Operated by twin-engined seven-seater machines of the Finnish aviation company *Aero*, this new semi-Arctic airline will connect at Åbo with the Stockholm-Åbo-Helsingfors service.

The Trans-India Route

THE flying-boat route across the Western part of India has now, it appears, been settled as the result of negotiations recently carried out by the Government of India with Udaipur and Gwalior Durbars. The latter have allowed the use of lakes Raj Samand and Madhosagar as part of the existing chain of landing places required by the new service.

The Government of India will provide and operate a medium and short-wave D/F wireless station at Madhosagar and also a meteorological station to work as part of the existing chain of the aeronautical ground organisation of the trans-India route The Gwalior Durbar intend shortly to lay out a large modern aerodrome at Gwalior which will provide the means of connecting the boat service by air with other parts of India. Imperial Airways will, of course, provide mobile equipment over the route.

Norwegian Discontinuation

THE Norwegian D.N.L. have issued a statement to the effect that operation of the Oslo-Stockholm line would be abandoned as from July 31. The cause of this step is that the D.N.L. had fixed a price of 80 Kroner for the trip, equalling the Copenhagen-Oslo ticket, but Swedish authorities forced them to raise the price to 95 Kr. As this rate is grossly in excess of prices for railway tickets, the passenger frequency turned out to be too low to make the Oslo-Stockholm service remunerative. The recent discontinuation of the line has a bearing on British interests, as the service was originally opened at least partly with a view to carrying transfer passengers from Allied Airways' North Sea service.

The Dangerous South Coast

CERTAIN air exercises will be carried out on the south coast on August 26, and between August 31 and September 9, and pilots are advised to avoid the areas concerned. These lie outside the Plymouth-Selsey Bill coast on the first day, and between Selsey Bill and Beachy Head on the remaining ten days. Transport pilots certainly have a lot to think about nowadays.

Berlin—Copenhagen by Night

FOR the first time since its inception, the time-table of the Copenhagen-Berlin service will be changed this winter. Southbound, the machine will leave Kastrup at 9 a.m. as usual, but the return from Berlin will be made at 5 p.m. instead of 4 p.m. earlier—which means a night passage. However, with adequate night-landing equipment at Kastrup and the fact that the pilots have several years' experience of night mail flying, D.D.L. and D.L.H. should experience no difficulties.

The Air France Strike Threat

NOW that M. Pierre Cot, the French Air Minister, has returned from his holiday he will have found trouble waiting for him. The pilots of Air France have threatened to call a strike if the first North Atlantic trials, to be made next month by the Latécoère *Lieutenant de Vaisseau Paris*, are not placed entirely in the hands of commercial pilots, mechanics, navigators and radio operators, who, as they point out, are specially qualified to carry out the test flights, having over two hundred crossings of the South Atlantic to their credit

The trouble has been brewing since last April when it was announced by the Air Ministry that the first flights across the North Atlantic would be carried out by a crew composed of French Air Force personnel under the command of Capitaine de Corvette Bonnot. The reason for this decision was that the *Paris* was at that time (and still is technically for that matter) the property of the Air Ministry and has not yet been officially handed over to the civil company. The announcement was greeted on April 6 by members of the French Association of air pilots and navigators with indignant protests, and the agitation has continued ever since.

The Air Ministry have been attempting a compromise by offering that all future flights after the first should be made by civil crews, but this has not satisfied the Association. The strikers will include the pilots and crews of Air Afrique, Air Blue and Aeromaritime.

RACING AT RAMSGATE

Mr. Elwell brings his victorious Cub in over the attractive clubhouse at Ramsgate. On the right is a detailed view of Mr. Elwell. (*Flight* photographs.)

Taylor Cub and Veteran Spartan First Home in Thanet Event : Generous Handicapping Permits Win at 71.5 m.p.h. : Gardner (Mew Gull) Averages 209 m.p.h.

SO long as air racing endures there will always be people who refuse to see that, in a race over a triangular course, a fast machine is less affected than its slower rivals by a strong wind because it spends a shorter time on the up-wind leg.

That fact, of course, must be a handicapper's golden text in such an event as the Thanet Air Race, flown last Saturday from Ramsgate Airport, in which a variety of machines made three laps of a triangular course in a strong northerly wind. Perhaps our maestros of the slide rule, Messrs. Dancy and Rowarth, were a shade too sympathetic toward the puny and aged in their defiance of Boreas, for we saw a Taylor Cub and an elderly Spartan Arrow leading home a field of sixteen, including a brace of Mew Gulls and the T.K.2.

The pilot of the victorious Cub was Mr. Paul Elwell. He was flying on behalf of Mr. A. J. Walter, who, encouraged by some astronomical sales figures from the States, is doing his best to get Britain Cub-minded. Second was Flt. Lt. H. R. A. Edwards in the evergreen Spartan Arrow which, so the tale is told, is none other than the Thanet Race victor of five years ago, and third came—yes—Alex. Henshaw in his virginal-hued but fast Mew Gull.

The award for fastest time went to Charles Gardner, whose Mew Gull has a Series II Gipsy Six engine and v.p. airscrew which gives him about 10 m.p.h. over his fellow Mew-enthusiast. Gardner averaged 209 m.p.h.

J. Vitols took the prize for the smartest turn-out with his Cirrus-Minor-engined V.E.F.12—a product which does Latvia no little credit.

(Left)
Flt. Lt. H. R. A. Edwards flew his elderly Spartan Arrow into second place and gave a creditable display of flying (afterwards) at next to no forward speed.

(Right)
Protagonists of the Mew Gull: Alex. Henshaw and Charles Gardner discuss chances. Henshaw came third and Gardner put up the fastest time. (*Flight* photographs.)

Mr. Nicholson took advantage of the wind to show some of the capabilities of his Rhonsperber glider. (*Flight* photograph.)

The course, starting from Ramsgate Airport, lay by way of Reculver Towers—the first turning point—and Richborough, where the mark was a laundry chimney. The total distance was about 70 miles.

Germany had two entries among the field of sixteen and Latvia, as already stated, was represented by the beautifully finished V.E.F. 12, which finished fifth. Originally the German team was composed of a Focke-Wulf F.W.56 (240 h.p. Argus inverted vee-eight), a Klemm Kl.35 (80 h.p. Hirth), and a Messerschmitt, but the last-named machine entered, like its companions, by the German Aero Club, failed to arrive, its place being taken by a Bücker Jungmann, which did not compete. The Focke-Wulf and the Klemm were in the hands of A. von Bohlen and E. Gerbrecht respectively.

The competitors, their machines, entrants, times and speeds are listed in the accompanying table.

The take-off was made in the direction of the wireless masts which entailed a sharp right-hand turn to get on to the course. From the spectators' viewpoint the whole affair went off quite uneventfully, although competitors subsequently spoke of very rough going. Low down-wind flying was, of course, *de rigeur*, and the bumps were no mean problem. Mr. Elwell reported an encounter with one particularly nasty jolt over some telegraph wires in which he fully expected to find himself entwined. He has been flying, incidentally, for about eighteen months.

Miss Gladys Batchelor—enthroned down Rochester way as the local air queen—was disqualified for taking her Cirrus-Minor-engined B.A. Swallow inside the turn at Reculver Towers. She crossed the line third.

The field closed up nicely toward the end, and it was quite a surprise to many to see the Cub come purring in to victory. The crowd appreciated Henshaw's dramatic finish at negligible altitude and searing speed. His flying was probably a bit more accurate than Gardner's, although Gardner could have dawdled very little to set up the fastest time of the day with an average of 209 m.p.h.

As entertaining as the race itself were the demonstrations of some of the competitors before landing. The Spartan, particularly, did things in the way of slow, into-wind flying which most private-owner machines of more recent vintage could not hope to accomplish.

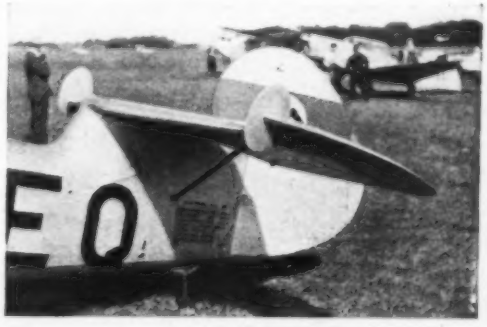
Awards on handicap were as follows:—(1) £50 and the Thanet Air Trophy; (2) £25 and a trophy presented by the Corporation of Ramsgate; (3) £10 and a trophy. The recipients were Messrs. Elwell, Edwards and Henshaw. Gardner and Vitols received special awards for the fastest time and smartest turn-out respectively. The presentations were made by Ald. H. Stead, Mayor of Ramsgate.

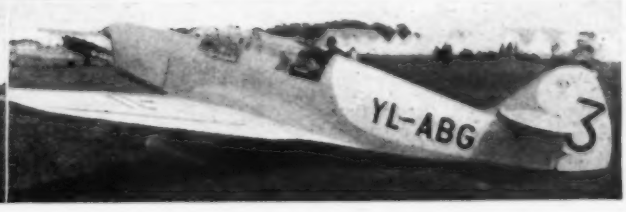
The park of demonstration machines was well filled, featuring, among other types, the latest gull-winged Stinson, the Heston Phœnix with Series II Gipsy Six and D.H. v.p. airscrew, the Porterfield, Taylor Cub, C.30 A Autogiro, Whitney Straight, Vega Gull, Hordern Richmond Autoplane and Monospar.

There was a demonstration of towed gliding, with Mr. Nicholson as towee, and Mr. Brie put the Autogiro in reverse over the crowd. Later in the afternoon Henshaw contributed a bout of aerobatics on his Mew Gull.

Five Hinds of No. 500 (County of Kent) (Bomber) Squadron did some plain and fancy formation flying, ending with a breakaway from echelon at a low altitude.

Race No.	Reg.	Aircraft.	Pilot.	Finished at.	Nett Time.	Speed.	Place.
				m. s.	m. s.	m.p.h.	
16	G-AESK	Taylor Cub...	P. B. Elwell	55 43	55 43	71.50	1
15	G-ABOB	Spartan Arrow	Flt. Lt. H. R. A. Edwards	57 48	43 13	92.50	2
4	G-AEXF	Mew Gull ...	A. Henshaw	60 22	19 17	207.00	3
18	G-ADEV	Avro 504N .	P. Phillips...	60 31	38 26	103.75	4
3	YL-ABG	V.E.F.12 ...	I. Vitols ...	60 37	29 30	135.50	5
6	G-AEKL	Mew Gull ...	C. Gardner .	60 42	19 04	209.00	6
1	G-ADNO	T.K.2 ..	G. de Havilland	60 48	23 49	167.50	7
5	G-AEUX	Miles W.S. .	I. Bayly ...	60 56	30 56	129.00	8
11	G-ABOE	Gipsy Moth .	Misses Glass	61 12	41 03	97.25	9
14	G-AEVA	Miles W.S. .	M. Lacayo ..	61 23	31 38	126.00	10
20	D-EDLY	Klemm Kl.35	E. Gerbrecht	61 31	36 23	109.50	11
7	G-ADGE	Miles Hawk Special	E. F. Walter	62 26	30 05	132.50	12
17	G-ABXR	Gipsy Moth...	R. Slazenger	62 27	43 34	91.50	13
19	D-IMEQ	Focke-Wulf	A. von Bohlen	62 38	26 49	149.00	14
8	G-ADLJ	Gipsy Moth...	Paddy Flynn	64 24	46 51	85.00	15
2	G-AERK	B.A. Swallow	Miss G. Batchelor	Disqualified for faulty turn at Reculver.			





Below is the striking Focke-Wulf advanced trainer which has an unusual tail unit as seen on the right. The third view is of the fascinating little Latvian V.E.F. 12 which was judged the smartest machine on parade. (*Flight* photographs.)

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

A GOOD CRUISE : The London flying boats of No. 204 (F.B.) Squadron at Malta, on their recent cruise from Plymouth to the Mediterranean.

MOVE OF A SQUADRON

No. 46 (Fighter) Squadron will move from Kenley to Digby by September 21, on which date the unit will be transferred to No. 12 (Fighter) Group.

ANOTHER ARMAMENT TRAINING CAMP

The R.A.F. Camp, Evanton, was transferred from the Coastal Command to the Training Command on August 16, on which date the camp was placed in the Armament Group.

No. 8 Armament Training Camp will open at Evanton on September 1, and the range at Dornoch on October 1.

The accommodation for Fleet Air Arm units at Evanton will be administered by Training Command and Armament Group.

AN IRAQ HONOUR

His Majesty King Ghazi of Iraq has recently issued two Royal Iradehs, one promoting Wing Cdr. E. L. Howard-Williams, M.C., to the rank of Amir Lewa (Brigadier General), with the courtesy title of Pasha, and the other awarding him the Order of The Two Rivers, for his services to Iraq as Inspector of the Royal Iraq Air Force.

No. 2 ROYAL AIR FORCE DEPÔT

No. 2 Royal Air Force Depot which formed at Henlow on May 27, and replaced the Recruits Wing at that station, will move to Cardington with effect from September 1, and will form part of the establishment of the R.A.F. Station, Cardington.

The Royal Air Force Depot, Uxbridge, will be known as No. 1 Royal Air Force Depot, with effect from September 1.

R.A.F. STAFF COLLEGE

As a result of the retirement of Sqn. Ldr. F. E. Nuttall and the exclusion from the 16th course, owing to service exigencies, of Sqn. Ldr. G. B. Beardsworth, the names of Sqn. Ldrs. Grace, C. F. H., and Pankhurst, L. T., have been substituted. Sqn. Ldr. Beardsworth will attend the 17th course beginning January, 1939.

FLYING ACCIDENT

The Air Ministry regrets to announce the following accident:—

Lt. John Alan Goldsmith, Royal Navy, Flying Officer, Royal Air Force, and A/C.1 Ernest George Clarke lost their lives in an accident which occurred at Donna Nook Bombing Range on August 17 to an aircraft of No. 810 (Torpedo Spotter-Reconnaissance) Squadron.

ROYAL AIR FORCE GAZETTE

London Gazette, August 17, 1937

General Duties Branch

Pilot Officer on probation P. D. J. Strong is confirmed in appointment, July 27. The following Acting Pilot Officers on probation are confirmed in appointments and graded as Pilot Officers, on dates stated: June 30, G. S. K. Haywood; July 3, P. L. Dakeyne; July 13, R. E. Shorter. P/O. R. R. S. Tuck takes rank and precedence as if his appointment as Pilot Officer bore date December 15, 1936. Reduction takes effect from July 22. Cdr. C. W. Byas, R.N., Sqn. Ldr., R.A.F., ceases to be attached to R.A.F. on return to Naval duty, May 4. Lt. R. E. Gunston, R.N., Flt. Lt., R.A.F., ceases to be attached to R.A.F. on return to Naval duty, August 2.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

F/O. G. G. Stead is transferred from Class A to Class C, January 8. The following are transferred from Class C to Class A on dates stated: June 27, Flt. Lt. R. B. Brown; July 13, Flt. Lt. A. M. D. Howes; July 26, F/O. C. Gardner. The following Flying Officers are transferred from Class C to Class AA (ii) on dates stated: June 1, W. E. Hampton; July 24, G. O. Hayns.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—J. W. B. Grigson, D.S.O., D.F.C., to Dept. of A.M.S.O., Air Ministry, 5.8.37, vice Wing Cdr. E. S. Goodwin, A.F.C. E. S. Goodwin, A.F.C., to No. 38 (B) Squadron, Marham, 5.8.37; to command.

Squadron Leaders.—O. G. Ridley, M.C., to Headquarters, Bomber Command, Uxbridge, 27.7.37; for Equipment Staff duties. A. W. B. McDonald, to No. 32 (F.) Squadron, Biggin Hill, 15.4.37; to command vice Wing Cdr. G. T. Richardson. A. P. C. Hannay, M.C., to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37; to command. E. C. Lewis, to No. 88 (B.) Squadron, Boscombe Down, 25.7.37; to command. A. H. Stradling, to No. 24 (Training) Group Headquarters, Halton Camp, 5.7.37: for duty as Senior Personnel Staff Officer vice Group Capt. W. D. Budgen, O.B.E. M. C. Dick, A.F.C., to

Air Observers School, North Coates Fitties; for flying duties, 21.7.37. C. A. Bell, to Special Duty List, for Signals duties at Royal Aircraft Establishment, 1.7.37. A. V. Hammond, to No. 31 (A.C.) Squadron, India; to command vice Sqn. Ldr. J. L. Airey, D.F.C., 21.6.37. H. M. A. Day, A.M., to No. 6 Flying Training School, Netheravon, 7.8.37. H. R. McL. Reid, D.F.C., to R.A.F. Station, Odiham, 8.8.37; for Air Staff duties. F. L. Pearce, to Headquarters, No. 5 (B.) Group, Mildenhall, 3.8.37; for Air Staff duties. J. R. Whitley, A.F.C., to No. 38 (B.) Squadron, Mildenhall, 9.8.37; for flying duties.

Flight Lieutenants.—G. W. Gay, to Headquarters, No. 12 (F.) Group, Hucknall, 26.7.37. L. S. Lamb, to R.A.F. Station, Cardington, 7.7.37. E. M. Donaldson, to No. 1 (F.) Squadron, Tangmere, 26.7.37. D. A. Pemberton, to No. 601 (County of London) (F.) Squadron, Hendon, 22.7.37. C. R. J. Pink, to No. 8 Flying Training School, Montrose, 31.7.37. A. J. Biggar, to No. 604 (County of Middlesex) (F.) Squadron, Hendon, 31.7.37. R. H. Young, to Special Duty List, whilst employed with South African Air Force, 30.7.37.

Flying Officers.—A. F. Johnson, to R.A.F. Station, Thornaby, 27.7.37. G. T. Toland, to No. 144 (B.) Squadron, Hemswell, 20.7.37. B. G. Carroll, to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37. K. J. McIntyre, to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37. E. D. Joyce, to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37. J. W. Deacon, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. R. H. Humphries, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. H. M. Starr, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. R. Leigh, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. H. T. Sutton, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. D. G. Torrens, to R.A.F. Station, South Farnborough, 5.8.37. E. A. Verdon-Roe, to No. 3 Flying Training School, Grantham, 27.7.37.

Pilot Officers.—J. Butterworth, to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37. D. P. Hughes, to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37. J. S. Laird, to No. 53 (A.C.) Squadron, S. Farnborough, 28.6.37. E. F. Pippet, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. G. V. Smither, to No. 59 (A.C.) Squadron, Old Sarum, 28.6.37. J. A. Crockett, to No. 77 (B.) Squadron, Honington, 28.6.37. K. T. Thompson, to No. 77 (B.) Squadron, Honington, 1.7.37. J. B. J. Boardman, to No. 77 (B.) Squadron, Honington, 12.7.37. G. E. Saddington, to No. 77 (B.) Squadron, Honington, 6.7.37. H. G. Marriott, to No 88 (B.) Squadron, Boscombe Down, 28.6.37. C. A. Richardson, to No. 88 (B.) Squadron, Boscombe Down, 28.6.37. G. V. Aylott, to No. 88 (B.) Squadron, Boscombe Down, 29.6.37. G. R. E. Gregory, to No. 148 (B.) Squadron, Scampton, 16.7.37. F. N. Hughes, to No. 148 (B.) Squadron, Scampton, 16.7.37. C. S. H. Richardson, to No. 148 (B.) Squadron, Scampton, 16.7.37. Y. P. Wilson, to No. 148 (B.) Squadron, Scampton, 16.7.37. G. F. Rodney, to No. 148 (B.) Squadron, Scampton, 6.7.37. J. T. Bouwens, to No. 211 (B.) Squadron, Mildenhall, 28.6.37. G. O. Mills, to No. 211 (B.) Squadron, Mildenhall, 28.6.37. G. D. Jones, to No. 211 (B.) Squadron, Mildenhall, 1.7.37. G. G. Storey, to No. 211 (B.) Squadron, Mildenhall, 1.7.37. D. G. Boehm, to No. 211 (B.) Squadron, Mildenhall, 24.6.37. D. A. Cameron, to No. 211 (B.) Squadron, Mildenhall, 24.6.37. I. M. Brodie, to School of Naval Co-operation, Lee-on-the-Solent, 2.7.37. P. D. F. Mitchell, to R.A.F. Station, Gosport, 19.7.37. R. H. McConnell, to R.A.F. Station, Gosport, 19.7.37. N. M. Bayliss, to No. 217 (G.R.) Squadron, Tangmere, 7.8.37. J. B. Flowerdew, to No. 3 Flying Training School, Grantham, 23.7.37. J. N. W. Farmer, to No. 11 Flying Training School, Wittering, 26.7.37. D. J. McGlinn, to No. 11 Flying Training School, Wittering, 23.7.37. G. A. H. Kent, to No. 9 Flying Training School, Hullavington, 19.7.37. G. C. Hyde, to Air Armament School, Eastchurch, 26.7.37. W. H. Powdrell, to No. 35 (B.) Squadron, Worthy Down, 27.7.37.

Acting Pilot Officers.—E. Parker, to No. 88 (B.) Squadron, Boscombe Down, 4.7.37. A. J. Madge, to No. 88 (B.) Squadron, Boscombe Down, 5.7.37. D. T. Johnston, to No. 7 (B.) Squadron, Finningley, 7.8.37. L. C. Withall, to No. 19 (F.) Squadron, Duxford, 7.8.37. K. B. T. Burns, to No. 25 (F.) Squadron, Hawkinge, 7.8.37. J. G. Cave, to No. 25 (F.) Squadron, Hawkinge, 7.8.37. W. T. Russell, to No. 35 (B.) Squadron, Worthy Down, 7.8.37. H. M. Burnell, to No. 38 (B.) Squadron, Marham, 7.8.37. I. K. P. Cross, to No. 38 (B.) Squadron, Marham, 7.8.37. B. V. Fanshawe, to No. 38 (B.) Squadron, Marham, 7.8.37. R. J. Sage, to No. 76 (B.) Squadron, Finningley, 7.8.37. A. M. Golton, to No. 82 (B.) Squadron, Cranfield, 7.8.37. F. W. Snell, to No. 88 (B.) Squadron, Boscombe Down, 7.8.37. W. R. Williams, to No. 97 (B.) Squadron, Leconfield, 7.8.37. B. H. M. Winslett, to No. 97 (B.) Squadron, Leconfield, 7.8.37. N. E. W. Pepper, to No. 139 (B.) Squadron, Wyton, 7.8.37. E. T. Fairbank, to No. 142 (B.) Squadron, Andover, 7.8.37. R. F. D. Anstead, to No. 217 (G.R.) Squadron, Tangmere, 7.8.37. A. V. Hunter, to No. 217 (G.R.) Squadron, Tangmere, 7.8.37. K. Petrie, to No. 217 (G.R.) Squadron, Tangmere, 7.8.37. J. R. Leatherdale, to Air Armament School, Eastchurch, 26.7.37. J. H. Chappell, to No. 3 Anti-Aircraft Co-operation Unit, Malta, 14.7.37. R. L. C. Todd, to No. 3 A.A.C. Unit, Malta, 14.7.37. J. L. Waters, to No. 3 A.A.C. Unit, Malta, 14.7.37.

Equipment Branch

Squadron Leaders.—T. G. Bowler, to "A" Equipment Depot, Hendon, 28.7.37; for Equipment duties. R. F. Osborne, to Aeroplane and Armament Experimental Establishment, Martlesham Heath, 4.8.37; for Equipment duties vice Wing Cdr. F. N. Trinder.

Flying Officers.—D. Stephenson, to R.A.F. Station, Thornaby, 7.7.37. H. F. Thomas, to No. 1 Equipment Depot, Kidbrooke, 2.8.37. E. F. Curtis, to No. 1 Equipment Depot, Kidbrooke, 2.8.37. H. Lovegrove, to No. 4 Equipment Depot, Ruislip, 2.8.37. A. C. Thorne, to No. 4 Equipment Depot, Ruislip, 2.8.37. J. S. Eley, to No. 4 Equipment Depot, Ruislip, 2.8.37. E. A. Rabbits, to R.A.F. Station, Cardington, 2.8.37.

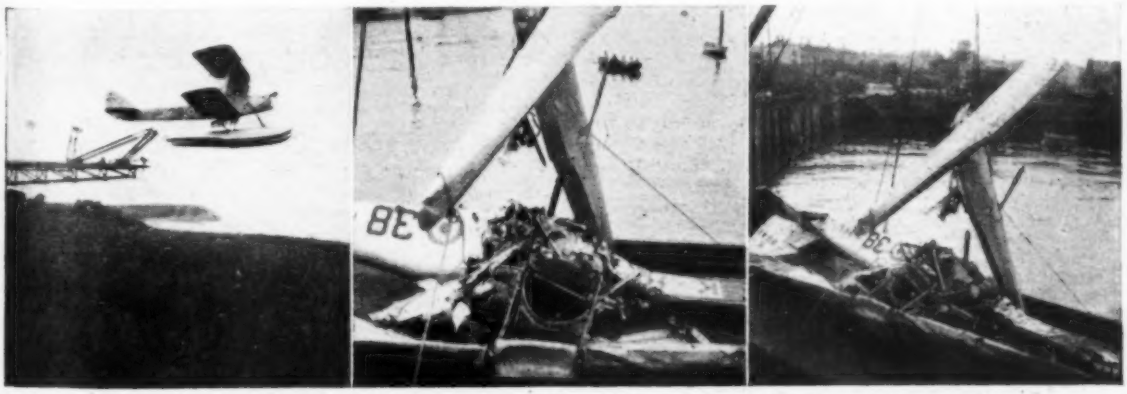
Pilot Officers.—J. S. Atkinson, to No. 1 Equipment Depot, Kidbrooke, 2.8.37. R. R. Goodbody, to No. 3 Equipment Depot, Milton, 2.8.37. A. R. Chrisp, to No. 4 Equipment Depot, Ruislip, 2.8.37. E. G. Farthing, to Aeroplane and Armament Exptl. Estab., Martlesham Heath, 2.8.37. B. R. Siminson, to Home Aircraft Depot, Henlow, 2.8.37. R. P. Norman, to Air Armament School, Eastchurch, 2.8.37. P. N. Sowman, to R.A.F. Station, Bircham Newton, 2.8.37. W. R. Ford, to R.A.F. Station, Boscombe Down, 2.8.37. R. F. B. Guy, to R.A.F. Station, Halton, 2.8.37. J. P. Cody, to R.A.F. Station, Hucknall, 2.8.37. F. P. Dawson, to R.A.F Station, Upwood, 2.8.37. R. V. B. Franklyn, to No. 3 M.T. Storage Unit, Mousehold, 2.8.37. R. H. E. Dowse-Brenan, to No. 13 (A.C.) Squadron, Odiham, 2.8.37. D. J. Barber, to No. 16 (A.C.) Squadron, Old Sarum, 2.8.37. C. T. Wardman, to No. 26 (A.C.) Squadron, Catterick, 2.8.37. A. J. Coatly, to No. 35 (B.) Squadron, Worthy Down, 2.8.37. A. M. Aberdein, to No. 207 (B.) Squadron, Worthy Down, 2.8.37.

Medical Branch

Squadron Leader.—E. Thompson, to Home Aircraft Depot, Henlow, 3.8.37.

Chaplains Branch.

Revd. O. R. I. Jones, to No. 6 Flying Training School, Netheravon, 19.7.37, for duty as Chaplain (Church of England).



GOOD HUNTING: Anti-aircraft gunners gave the lie to those who say that they will have only a moral effect on air raiders, when the 171st Battery, 61st A.A. Brigade R.A., Territorial Army, formerly known as the Finsbury Rifles, shot down a Queen Bee at their camp at Watchet, Somerset, on August 13. The Queen Bee, developed from the Tiger Moth, is a target aeroplane, controlled by wireless. They were intended for use by the Fleet, but this year they have been supplied for use by the Army too. As shown in these exclusive photographs, this one was catapulted into the air and she rose to 4,000 feet over the Bristol Channel. She was about a mile off when two A.A. guns opened fire, and the third volley hit her behind the engine. At first it was feared that she might crash on to the Battery, but she came down in the sea. The Gipsy Major engine broke loose and sank, but the fuselage and portions of the wings were salvaged.

THE INDUSTRY

Case-hardening

A VERY practical little handbook on case-hardening theory and practice has been issued by W. T. Flather, Ltd., Standard Steel Works, Sheffield, 1. The aspects covered include case-hardening by the box method; heat treatment after carburising; fractures; common faults; exfoliation; brittle cores; distortion; and special forms of case-hardening.

W. T. Flather are specialists in case-hardening steels and carburising compounds.

The Eagle Multiplies

AS a result of the growing use of special aerial cameras for surveying, exploration and military reconnaissance, the Williamson Manufacturing Co., Ltd., will increase its output of aircraft cameras by 40 per cent. next month, when extensions to its Willesden works will have been completed.

Sound Methods

A QUITE unusual booklet has been produced by Brook Motors, of Empress Works, Huddersfield, called "About Ourselves, 1904-1937." Brook electric motors are mentioned only briefly; the rest deals with the sound and original lines on which the business is run, particularly in regard to employees.

Seen at the Source

ONE of the units at the Home Aircraft Depot, Henlow (now the H.Q. of No. 24 (Training) Group) is the Royal Air Force School of Aeronautical Engineering. Recently a party from the School, accompanied by the Chief Instructor, Sqn. Ldr. C. W. Weedon, and Mr. H. R. P. Patterson, visited the Coventry works of Armstrong Siddeley Motors, Ltd., where they watched Cheetah and Tiger engines under construction.

After being entertained to lunch the party went on to the works of Sir W. G. Armstrong Whitworth Aircraft, Ltd., and were able to see the Whitley bomber in course of construction.

Wellworthy Dividend

WELLWORTHY, LIMITED, the piston and ring manufacturers, have declared a dividend of 6 per cent. on their preference shares for the half-year ending August 31.

Contribution to Comfort

A FURTHER fact has come to light regarding the Mitsubishi monoplane *Divine Wind*, of Tokio-London fame, in that the machine was equipped with seat cushions manufactured by the Japanese firm of Shimizu under licence from the Hairlok Co., Ltd., of Magna Works, Bedford. This firm's rubberised hair is already widely used for aircraft upholstery in this country.

Electric Welding Methods

MR. PETER W. FASSLER, president of the Fassler Welding Machine Corp., Inc., of Detroit, has arrived in this country to study welding methods in the British sheet metal trade.

During his stay he will act as electric welding consultant to E. H. Jones (Machine Tools), Ltd., The Hyde, London, N.W.9, who are sole agents for Fassler electric welding machines in Great Britain.

A New Constructional Material

AMONG new constructional materials which should find many uses in the building of aircraft factories and hangars is a panelling board known as "Kimoloboard," and produced by Cellactite and British Uralite, Ltd., of Lincoln House, High Holborn, London, W.C.1. Briefly, the main claims for "Kimoloboard," which is supplied in various sized sheets normally $\frac{3}{16}$ in. in thickness, are that it is completely fireproof, it does not warp, is free from wooden vegetable fibre and therefore vermin-proof, it is a good heat and sound insulator, and it can be "worked like wood." Paint or distemper takes well on the surface, while for many uses the natural colour and finish of the board, soft and pleasing in tone, is sufficient.

AERONAUTICAL PATENT SPECIFICATIONS

(The number in brackets are those under which the Specifications will be printed and abridged, etc.)

(Published July 29, 1937.)

31962. HEINKEL, E.: Elevation-control mechanism for aircraft (468,062).
32534. MYERS, G. F.: Aircraft (468,063).
32746. ELLOR, J. E.: Air supply to carburettors of internal-combustion engines for aircraft (468,064).
36012. ROUV, A. L. M. A.: Means for damping vibrations of aircraft fixed wings, or supporting-surfaces having a limited pivotal movement (468,365).
69. BROWN, J. P. and ALDRIDGE, F. D.: Gyroscopic apparatus (468,288).
312. WESTLAND AIRCRAFT, LTD., MATTHEWS, E.: Ammunition carrying and supplying devices for aircraft or other fighting machines (468,417).
1055. CHARUVY, L.: Aircraft (468,241.)
8245. BARKER, G. G. (Bendix Aviation Corporation): Inclinometers (468,300).
11670. CAPRONI, G., LONGO, A., and MATTIOLI, G. D.: Devices for increasing the lifting power of the wings of an aeroplane (468,149).
11755. FAIREY AVIATION CO., LTD., and ORDIDGE, F. H.: Retractable undercarriages for aircraft (468,092.)
30524. SAULNIER, R.: Aircraft (468,331).
30657. TYLER, S. H.: Anti-dazzle devices for vehicles and aircraft (468,181).
30934. CIERVA AUTOGIRO CO., LTD.: Aircraft with rotative wings (468,183).
31120. GOURLEY, G.: Helicopters (468,186).
34324. GETEFO GES. FUR TECHNISCHEN FORTSCHRITT: Propeller drive, more particularly for aircraft (468,338).
9424. FAIREY AVIATION CO., LTD., and FORSYTH, A. G.: Mounting of internal combustion engines (468,206).
822. Soc. D'INVENTIONS AERONAUTIQUES ET MECANIQUES S.I.A.M.: System of retractable landing-gear for aeroplanes (468,196).

(Published August 5, 1937.)

3045. GRAVINER MANUFACTURING CO., LTD., and SALMOND, H. M.: Flame-operated switches for fire preventing or extinguishing equipment upon vehicles, craft and the like (468,426).
27683. PITT, H. L.: Means for controlling aeroplanes when in flight (468,559).
33357. SAFE-BEAM LAMP, LTD., and LUND, W. H.: System for lighting roads, aerodromes, wharves and similar surfaces (468,436).
546. WESTLAND AIRCRAFT, LTD., PETTER, W. E. W., and DAVENPORT A.: Aircraft (468,565).
6318. RABATEL, H. A.: Aircraft (468,719).
24932. FAIREY, C. R.: Blades for airscrews and the like (468,588).
25073. SIEMENS APPARATE UND MASCHINEN GES.: Aileron control systems for aircraft (468,487).
28895. ELEKTRONMETALL GES.: Wheels for aircraft (468,734).
30146. JUNKERS FLUGZEUG-UND-MOTORENWERKE AKT.-GES.: Variable-pitch airscrews (468,603).
31321. SPERRY GYROSCOPE CO., Inc.: Sound-proofing structures (468,495).
32067. ETABLISSEMENTS, D. F.: Method of supplying air under pressure and applying suction on board aircraft, and apparatus therefore (468,667).

(Published August 12, 1937.)

1443. BENDIX AVIATION CORPORATION: Electrical instruments for transmitting and/or reproducing angular movements (469,026).
1471. DOWTY, G. H.: Position-indicators for aircraft parts, such as undercarriages and flaps (469,032).
1611. LANG, A. A. D.: Airscrews (469,086).
7452. DUNLOP RUBBER CO., LTD., WRIGHT, J., and TREVASKIS, H.: Pneumatic control apparatus for mechanisms such as machine guns and camera guns on aircraft (469,054).
27432. OSAKEYHTIO PHYSICA AKTIEBOLAG, and TERA, M.: Correction calculating ruler for the calculation of flying path deviations (468,996).
5256. BENDIX AVIATION CORPORATION: Electrical instruments for transmitting and/or reproducing angular movements (469,071).
5549. JUNKERS & CO., GES.: Multiple-way gas cocks (468,939).

(Published August 19, 1937.)

31716. LANG, A. A. D.: Machines for shaping airscrew blades (469,173).
2582. TROTMAN, E.: Screw propellers (469,124).
10754. PHILLIPS & POWIS AIRCRAFT, LTD., and MILES, F. G.: Wing flaps for aircraft and their control (469,149).
11926. SEIDEL, R.: Variable-speed gearing (469,268).
12810. CAPEL, L. J. M.: Parachutes (469,207).
26364. ELEKTRONMETALL GES.: Wheels for aircraft (469,292).

(Published August 26, 1937.)

26242. KING, K., and KING'S TRIM INDICATOR, LTD.: Trim indicators for ships, aircraft, or the like (469,547).
32548. FAUDI, F.: Shock-absorbing struts for aircraft under carriages (469,473).
2203. BRIE, R. A. C.: Landing and launching device for aircraft (469,554).
2488. MAYO, R. H., SHORT BROS. (ROCHESTER & BEDF RD), LTD., and CLARKE, A. W. S.: Composite aircraft (469,557).
2747. POUIT, R. J.: Flying machines (469,739).
3004. FAIREY AVIATION CO., LTD., and FORSYTH, A. G.: Power plants for aircraft (469,615).
3003. FAIREY AVIATION CO., LTD., and FORSYTH, A. G.: Mounting of internal combustion engines (469,614).